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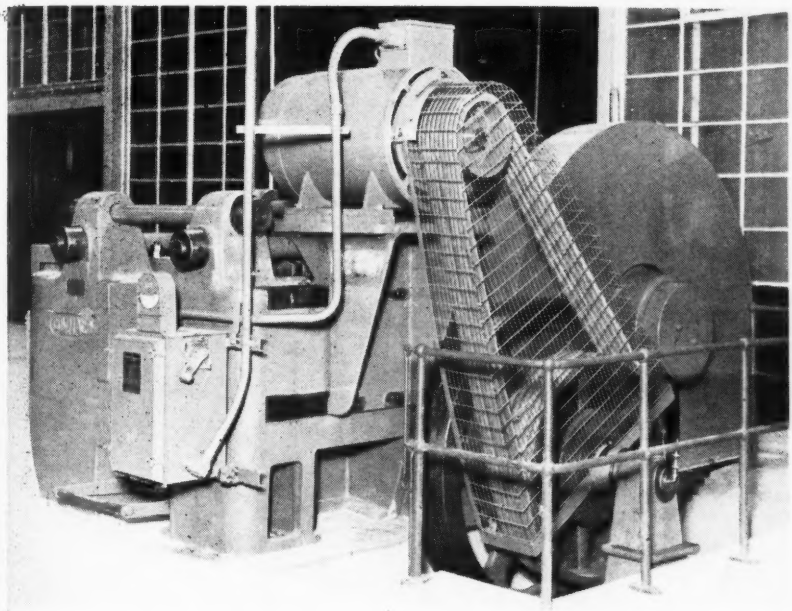

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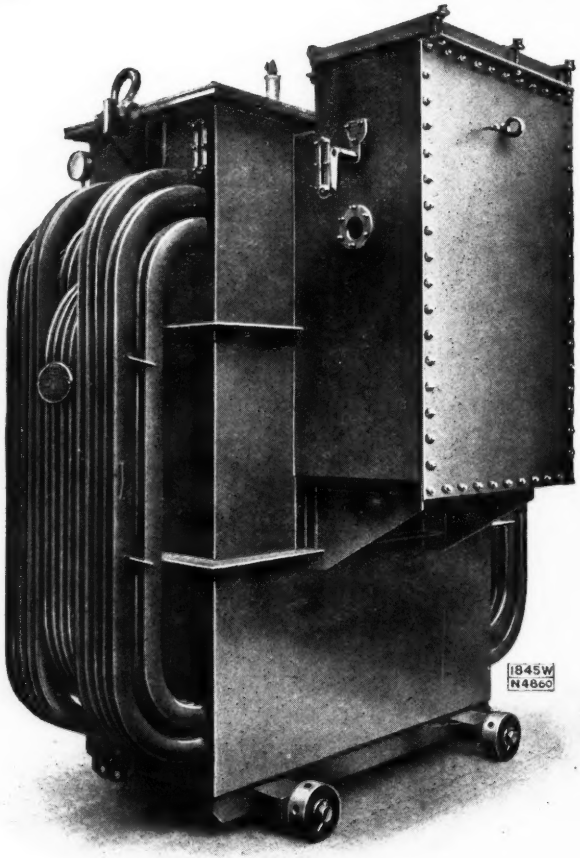

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ELECTRICAL REVIEW

Volume CXXX **No. 3347**

Friday, January 16, 1942

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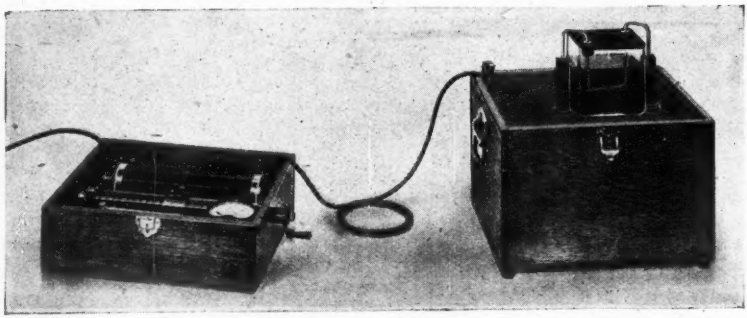

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXX. No. 3347. JANUARY 16, 1942 6d. WEEKLY

Electrical Instruments

Full Employment of Available Types

THIS war has changed many things, and its continuance may be expected to alter some others. The implications of its entangling consequences, both immediate and deferred, are compelling the fullest use, which presupposes the wisest disposition, of all available as well as potential resources; first to permit and subsequently to sustain joint endeavour. Little is usually gained without co-operation, by comparison with that which can be accomplished when there is a common cause to serve.

In particular the mutually assistive spirit that the war effort has already fostered among makers and users of indicating instruments and recording meters has prompted Mr. W. Phillips to urge still closer co-operation in future. His New Year message of good will on another page, as the chairman of the Meter and Instrument Section of the Institution of Electrical Engineers, mentions a few attainments while instancing several progressive possibilities.

Aid from Users

Elsewhere Dr. M. C. Marsh has similarly pleaded quite recently with instrument makers in general for more collaboration. He believes, very reasonably, that co-operation should begin with the customer trying to employ a standard product whenever he can. It is really remarkable how many there are, and quite surprising how often they can be adapted in ways that cannot be evident to those not familiar with the trade, perhaps aided by some slight change in the user's procedure, so as to avoid entirely new designs.

Not only may the purchaser thus expect more readily to find what he is seeking, but he will certainly obtain better value for the money he expends because the always heavy initial designing and tooling costs will already have been spread over large numbers of routine products, whereas the work performed in the fashioning of special instruments, particularly on the administrative and design side of the balance sheet, is out of all proportion to that needed for multiplying standard items. This aspect of the matter, Dr. Marsh rightly insists, is very important just now when every unnecessary effort should be eliminated from such a vital industry.

Exchanging Experience

It is not denied, of course, that fresh models, or special variants, will continue to supplement the choice of stock types. On the one hand prospective users with intimate knowledge of industrial processes generally have but the slightest notion how their measurement needs may best be satisfied. On the other hand manufacturers may have several ideas on which to base instrument construction without being acquainted with the surroundings in which they will have to function. Here Dr. Marsh has a strong case for combining the two complementary funds of experience.

To co-operate in the dictionary sense of that word is to profit mutually from conjoint action to the same end in the common interest. Properly to do so will mean

forced abandonment of habits which are so easily formed when there is no incentive to check the obeying of impulses in a mechanical sort of way. One of the few advantages of war is that when we find ourselves unable any longer to do some things in accustomed ways the discovery is made that new methods can be superior to the old.

Saving Fuel

SINCE thermal efficiency is the backbone of cheap electric power, the engineers of our industry have for many years worked to secure the lowest consumption of coal for each horse-power produced. Further improvement is likely to follow only the adoption of more elevated steam conditions at considerable capital outlay. It would seem, therefore, that the electrical engineer can do little to aid the coal economy campaign of the Mines Department beyond substituting electric motors driven by power produced under the most favourable conditions for small and relatively inefficient local prime movers. This, however, is not always practicable in present circumstances.

Combustion Difficulties

THE most effective way in which electrical engineers can collaborate with the Mines Department is probably the negative one of preventing an inordinate rise in the amount of coal required per kWh generated. It is not merely a question of unsuitability of the coal to the type of equipment installed or of its ash content or low calorific value. After a while the operation methods of the boiler house might be adapted to these and settle down to a fresh routine. The trouble often is that the type and quality of coal is so erratic that a new "routine" would have to be established several times a shift. But the greater the odds the greater the achievement.

Contractors' Co-operation

ELECTRICAL contractors are strong individualists. That explains why very little seems to have been done in the way of local amalgamation, suggested as a means of preserving the businesses of contractors, who owing to the shortage of work or labour or because they have been called up or transferred to other work, have had to close down. That is not to say that contractors are lacking in the co-operative spirit; they apparently prefer not to be rigidly bound. At Derby, for instance, while the local E.C.A. branch thinks that little in the way of amalgamation can be achieved at the present time it speaks of "the creation of a mutual understanding between contractors to club together and help each other out when difficulties arise." Two local contractors are already operating together in this way with satisfactory results. At Oldham, too, the E.C.A. members have prepared plans for carrying on the business connections of one of their number called to national service. The Bournemouth branch also has a co-operative scheme in operation.

Rules and Registration

As we have already reported, the war is not interrupting the activities of the National Committee on Statutory Wiring Regulations and Registration. The draft registration scheme has now been amended and approved by the Committee and sent to the Institution of Electrical Engineers for consideration. The Minister of Works and Buildings, who is interested in the subject, has also received a copy. Lord Reith expects to consult the I.E.E. in such matters as this. Replies received from the chief engineers of supply undertakings to whom a statement showing the necessity for compulsory regulations and registration of contractors and operatives was sent show that there is a majority in favour of the scheme. The Committee hopes that the I.E.E. will deal with the questions of a condensed code of safety regulations and the compliance of apparatus and materials with approved standards.

Science and the War

THE caution given at the conference of the Association of Scientific Workers last week-end that proposals made for the better use of science in the war effort must fit in with the existing scheme of things was probably not unnecessary. Often in normal times our attention has been drawn to excellent ideas, the flaw in which has been that their embodiment in useful form would have entailed revolutionising manufacturing procedure or at least scrapping existing plant to an extent that the improvement could not justify. The seeing of visions is not to be deprecated for long-range planning, but generally the need, as now, is for immediately practical results.

The Instrument Industry

Desirability of Closer Co-operation

By W. Phillips, M.I.E.E.

A New Year message from the Chairman of the Meter and Instrument Section of the Institution of Electrical Engineers

DEVELOPMENTS in instruments have been many and varied during this war period, although under present circumstances they cannot be detailed; but as so much has been accomplished by co-operation between makers and users in several directions, it may not be out of place to plead for further efforts in this direction. Owing to the necessity of largely increased output and the quick establishment of new types of instruments for the Services, makers have co-operated and exchanged information and have been mutually helpful to a degree not hitherto attained. Much more, however, can be done and in view of probable post-war competition a spirit of closer co-operation is a matter of prime importance.

A considerable amount of agreement has already been reached in several directions; for example, standard cases having the same overall dimensions and fixing holes and fixed terminal positions have been adopted for the use of the Services, and for the G.P.O., thus enabling all makes of certain sizes of instruments to be interchanged. This could, with advantage, be supplemented by agreement among makers and users as to standard dimensions of cases for commercial switchboard instruments, which would result in the elimination of a large number of redundant sizes.

Mr. W. Phillips

It is obvious that this would entail sacrifices on the part of almost every maker, but the ultimate gain would make it worth while. At the same time the user would know that any standard instrument would occupy the same space and have the same fixing holes, and the switchboard designer would require one set of drawings only instead of a set for each make of instrument.

Co-operative Buying

An electrical instrument comprises a number of parts, such as springs, jewels, pivots, copper wire, etc., and many of these parts are required to fine dimensions and to rigid specifications with regard to quality. The parts are small, and for each individual maker may amount to a comparatively small amount in bulk and weight, but in the aggregate, taking the requirements of all makers, the quantities are considerable. Here is perhaps the possibility of co-operative buying. At present it often happens that the requirements of a single maker are insufficient to make it worth while for a supplier of the raw material to bother with it, hence delay and sometimes the necessity of using a not altogether suitable substitute.

Co-operation, to my mind, can mean much more than what has been mentioned above. It implies rationalisation in the dictionary meaning of the word—the elimination of the insane cut-throat competition that obtained both before and after the last war, which benefited neither maker nor user; and the pooling of knowledge and basic patents for the common good, while still retaining individuality of action in their use.

These may seem Utopian dreams, but some such measures are essential if the instrument section is to achieve the position in industry that its importance merits. All advance in electrical science and manufacture is based upon accurate measurement, and the existence of a strong and progressive instrument section is just as necessary as any other branch of the industry.

Individuals engaged in instrument and meter work, both manufacturing and testing, can materially assist towards the desired end by joining and actively supporting the Meter and Instrument Section of the I.E.E.

Exchange of Experience

The Section's activities cover very much more than the manufacture and use of instruments and meters. All electrical measurement comes within its scope, and there are many workers who are not at present members of the Section, whose knowledge and experience would be of great value to the industry generally, and the Meter and Instrument Section of the I.E.E. is the best channel for their dissemination. Apart from that, the opportunity which the Section affords of meeting fellow workers and discussing together difficulties and problems that arise has proved to be of great value. In my experience the assistance gained in this way has often helped to solve some outstanding difficulty.

There is one way, at least, in which the

majority of members can further the aims of the Section, and that is by attendance at, and by contributing to, the informal discussions. It is granted that we cannot all write an acceptable full-length technical paper, but there are few of us who cannot supply some item of general interest from personal experience, or who have not some difficulty or query that could be aired with advantage to all. It is an ordeal to stand up and speak in the lecture theatre, and to make oneself heard without losing the thread of one's remarks, but it is amongst friends that we speak, our informal remarks are not reported, and sooner or later the necessity of speaking in public will arise if a position in the industry is to be attained, and the informal discussion is the best of training grounds for this.

In offering, therefore, all workers in the field of electrical measurement greetings and best wishes for 1942, a hope is expressed that the present spirit of co-operation will be still further fostered, and that members of the Meter and Instrument Section of the I.E.E. will do all that they can to make the Section of still greater value to the industry generally.

Comparing Tariffs

An Alternative to the Usual Method

By J. P. S. Pillans,
M.I.E.E., M.I.Mech.E.

IT is sometimes necessary to compare dissimilar two-part tariffs, or a two-part tariff with a flat rate, in order to determine their relative merits on the score of economy or for other reasons. Problems of this type occur, for instance, when comparing costs of local generation and mains supply or the costs of mains supply to two establishments in different areas. With two-part tariffs, preponderance in the fixed component may be wholly or partly offset by inverse difference in the other. A comparison of a two-part tariff with a flat rate is merely a simplification of the comparison between two two-part tariffs, the work being halved.

There are two methods of reducing unlike tariffs to a common basis. The first, which is commonly employed, is to summate the estimated costs under both tariffs over a given period (say twelve months) and to arrive at a comparison on the basis of the annual bills. The second, here discussed, is to reduce the two-part tariffs to equivalent flat rates, *i.e.*, the inclusive cost per kWh. In the first method an assumption of the load factor is inherent in the assignment of particular values to the estimates of demand and consumption, but a comparison so based may not hold good if those estimates are not realised in practice, *e.g.*, if operating conditions change.

The second method requires the assumption of a value for the annual load factor in the first instance, thus eliminating the calculations involved in assuming values for demand and consumption. The principle is the same in both cases, although the procedure is simplified by one assumption instead of two. In either it is easy to arrive at an assumption which, however carefully prepared, may be falsified in practice. In the second method, however, accuracy is made independent of close estimating by comparing the tariffs at two other load factors, *e.g.*, those say at 10 per cent. above and 5 per cent. below the original estimate. The time occupied in making the three comparisons is but a fraction of that required for one, probably incorrect, comparison by the other method.

The *modus operandi* is as follows, the object being to reduce the two-part tariff to the equivalent flat rate cost in pence per kWh at the load factor selected, which may be taken to the nearest 5 per cent.

Estimate the annual load factor at which the tariff is likely to be used. (Single-shift working fixes the maximum annual load-factor at about 30 per cent. and two-shift working at about 60 per cent.; holiday periods tend to reduce and regular overtime to increase the value to be assumed.) Refer the estimated annual load factor to a table, which can be easily worked out to show the cost in pence per kWh of the demand charge at various kW for different load factors.

Thus, at 100 per cent. load factor, £1 per kW gives a cost per kWh of 0.0274d., being proportionately more for higher kW charges and lower load factors. To the m.d. charge thus reduced to a flat rate add the kWh component of the tariff plus fuel cost and other adjustments and compare the result with the corresponding figure, similarly obtained, for the other tariff. Repeat the comparisons with load-factor values above and below the original estimate.

As an example, assume a factory to be working for eight hours a day at an estimated load factor of 25 per cent. Comparison is required between tariffs of £6 5s. per kW plus 0.6d. per kWh and £7 per kW plus 0.5d. per kWh. In the first case the overall cost per kWh is 1.2850d. and in the second 1.2672d. per kWh. At 20 per cent. load factor the corresponding figures are 1.4562d. and 1.4590d., and at 30 per cent. they are 1.1708d. and 1.1393d. The second tariff is shown to be more favourable to the consumer at load factors above about 22 per cent.

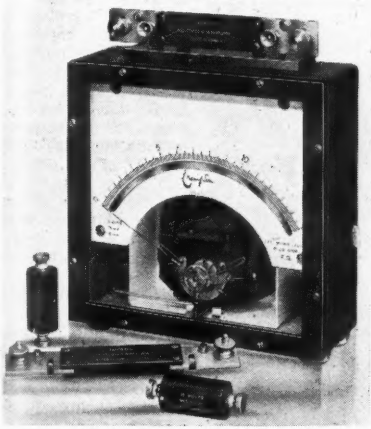
Educational Instruments

Meeting the Needs of Various Institutions

THE requirements of educational institutions for electrical indicating instruments are as varied as those of industry and may even be more so, for these institutions range from the research laboratories of Universities to secondary school science classes whose teachers have to manage with, if not be satisfied with, three or four indicators which can hardly be properly described as "instruments." Universities, senior and junior technical colleges, public schools and others right down to the senior elementary schools, may need demonstration as well as utility apparatus, or simply instruments for measurement.

For simplicity these observations have been confined to pointer instruments of the current and voltage indicating class

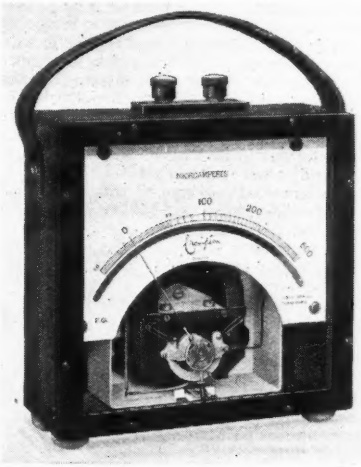
The advanced electrical, or physics, or communications laboratory will require a limited number of the highest grade instruments of sub-standard accuracy, but measurements that would be made with such instruments are more frequently made by the potentiometer method against standard resistances with errors not exceeding one or two parts in ten thousand.



Multi-range moving coil universal indicator with linear scale and directly attachable multipliers (slotted bobbins and shunts) (Crompton Parkinson)

The few high accuracy indicators available need great care in handling and use and in many cases will have a useful life of not less than fifty years when they are only used by teaching or research workers.

In the larger electrical and physics laboratories the indicating instruments are generally single-purpose and single-range patterns, preferably with their movements exposed to view for examination purposes. In the smaller laboratories instruments generally have to be used for a wider range of experimental tests and demonstrations; therefore they may be multi-range and suitable for both current and voltage



Portable instrument with exposed movement and displaced-zero logarithmic scale of 50-0-500 mA range readable down to 1 mA (Crompton Parkinson)

indications. For simplicity of reading they normally have a single scale with the standard 150 or 75 divisions, with interchangeable external directly attachable multipliers if of the DC moving-coil type.

For the measurement of low AC potentials rectifier moving-coil instruments are normally used and for higher voltages the moving-iron type with nickel-iron alloy elements, designed to produce approximately linear scale markings. For current measurements the same AC type of movement is used with a self-contained single-range winding, with a closely divided scale of not less than 8 in. length and a knife-edge pointer, a small lens frequently being used when making readings. Multi-ratio transformers of Class B accuracy are generally used

with an indicator wound for 0.5 or 1 A, giving readings down to 0.05 A and, with from 10 to 20 ratios, up to 200 A. For most AC measurements the dynamometer type of instrument was formerly used, but the remarkable improvement in moving-iron types has resulted in their being generally preferred.

Only the larger, or more advanced, laboratories had indicating wattmeters in their equipment because formerly AC measurements were of less relative importance, while the instruments were comparatively expensive and often wound for single ranges, so limiting their utility. Wattmeters of suitably robust construction wound for up to 0.5 and/or 1 A and for ranges up to 15 and 120 V are now a general requirement, a multi-ratio transformer being used for the larger currents and resistance added in the potential circuit for higher voltages. The design of the wattmeter movement should be such that wide variation in frequency and power factor does not materially affect the accuracy of indications. The ranges mentioned are suitable for power transformer iron and copper loss tests and for normal bench voltages.

An essential feature of all pointer instruments used in educational institutions is that their dials should be marked with their resistance and other particulars. Although the usual commercial moving-coil voltmeter resistance of 66.6 ohms per volt is sometimes acceptable, self-contained voltmeters are generally required to have a resistance of 200 to 1,000 ohms per volt.

For students' use instruments should be nearly mishap proof and robust, both electrically and mechanically, which remark applies particularly to those used in junior technical and other schools. It is usual to provide that momentary overloads up to 1,000 per cent. shall not damage the instruments; in the case of galvanometers, calibrated or uncalibrated, used for null work, momentary overload capacities up to 3,000 per cent. are called for. Among science masters the term "galvanometer" is used widely and frequently to describe any moving-coil instrument; a definition of the word is urgently desirable for at present it is applied to anything from the ultra-sensitive suspension type instrument to a small-cost low-range ammeter.

Galvanometer with 3-in. dial calibrated 2-0-2 mA under transparent cover mounted on inclined rubber base (Crompton Parkinson)

A most essential feature of instruments for use in educational institutions is that their movements shall be open to view, both for instructional reasons and to permit examination of their condition by the stewards in charge of equipment. Their usage is often relatively rough and the convenience of being able to examine the movement and accessories without opening the case is obvious. A diminution of pivotal and other mechanical damage has been effected by the adoption of 45 deg. angle bases of cast rubber with their under surfaces designed to minimise slipping on polished surfaces, such as desk tops and tables.

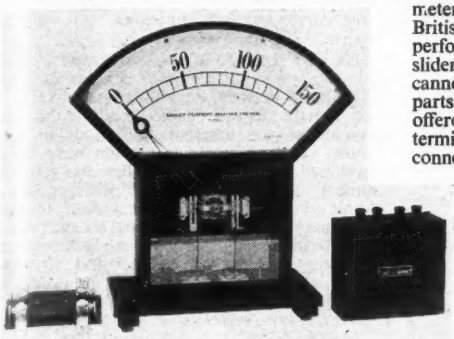
Very considerable development of moving-coil instruments having non-linear scales was taking place in the years preceding the war. Standard designs were produced with logarithmic scales permitting comparatively inexpensive instruments to give indication down to one micro-amp or a few micro-volts; double logarithmic scale markings were produced for instruments for null tests, others with logarithmic scales from a displaced zero, or giving maximum sensitivity two-thirds over scale. Instruments with such scale markings can be used with standard shunt and resistance multipliers and cost little, if any, more than linear scaled instruments.

In selecting a design of movement for purchase, simplicity of assembly with the minimum number of parts is an important consideration in respect of their maintenance. Few scholastic institutions have arrangements for obsolescence and instruments bought as part of the original equipment may be expected to last as long as the institution itself in spite of the adverse conditions in which they are used.

It is satisfactory that British makers have almost wholly recovered a class of business which for a long period went almost exclusively to foreign manufacturers as they have gone one better than their competitors in studying and meeting the requirements peculiar to that class of customer.

The Muirhead system of "Munit" box construction will be remembered. Being all-metal, it provides both mechanical strength and good electrical screening. It can be employed for boxes of all sizes provided their length and

breadth are multiples of 0.5 in. so that boxes of all sizes may be bolted together in either direction, or on to a base board or panel; these



Educational type DC indicator 0-150 mV range with glass front and external series resistance and shunt (Elliott Bros.)

form relatively cheap assemblies for temporary and semi-permanent installations. The series of cheap "Munit" resistances introduced specially for educational work are only adjusted to 1 per cent., but are nevertheless wound non-inductively in the same manner as more accurate patterns.

Single and double tubular element potentiometers and adjustable resistors are made by the British Electric Resistance Co., Ltd., with perforated metal covers totally enclosing the slider bar and terminals so that the operator cannot come into contact with any "live" parts. To make them more adaptable there is offered a choice of several standard forms of terminals, namely, bushed entry for flexible connector, conduit cable entry, two-pin shrouded plug and socket (a three-pin plug or tumbler switch can be supplied) or shrouded bakelite screw terminals with non-removable heads which prevent contact with bare metal or wire. These protected resistors are interchangeable with standard patterns having the same fixing centres and overall dimensions.

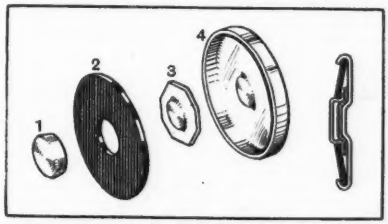
Copper-Oxide Cut-Outs

A SUBSTANTIAL proportion of the outdoor protective illumination of American industrial yards and works, as well as 90 per cent. of street lighting in the United States, is furnished by lamps connected in series. Each is shunted by a cut-out, which restores continuity of the AC circuit whenever a lamp burns out. For this purpose "Novalux" copper-oxide cut-outs are produced in three ratings, identifiable by their insulating fibre washers, which are coloured brown for 50 to 90 V, black for 100 to 200 V and red for 250 to 350 V.

According to the *General Electric Review*, the cap is an embossed piece of copper-bearing silver alloy, oxidised on both sides to form a coating that is hard, uniform, smooth and permanently dielectric. Operating characteristics are determined during the manufacturing process by automatically controlling the temperature of the furnace and the length of time the oxidising action therein is permitted to continue. Protective aluminium eyelet (1) and bevel (4) discs make contact on both sides of the oxide cap (3), but are insulated from each other by a waterproof fibre washer (2), thus providing metallic contact with socket prongs when the cut-out is in place.

This robust total enclosure enables the cut-outs to withstand temperature and pressure without materially lessening their dielectric breakdown value and prevents their component sections coming apart by reason of dampness, or friction, or careless handling, so that they may safely be carried loose in linesmen's pockets. The latest designs have a film cap of octagonal shape while the retaining discs have continuous edges, which are not serrated. These features are beneficial in the case of larger diameter and higher voltage cut-outs, because creepage distances are greater and there are no sharp tabs or burrs that might scratch, or even puncture, the oxide film when tightly compressed between stiff socket prongs; also avoiding radial slots through which moisture might enter.

In 20-A higher voltage circuits the cut-out temperature may approach to 177 deg. C., dropping to 48 deg. C. after lamp failure. In 6.6-A medium voltage circuits the temperature will be 70 deg. C. after breakdown. Both are well below the 260 deg. C. annealing temperature of the spring clips or prongs of "Novalux" sockets and receptacles.



Constructional details of cap-and-disc form of copper-oxide lamp cut-out

Fuel Efficiency

A MEETING is being held at the City Museum, Leeds, on January 20th at 2.30 p.m. when Mr. E. V. Evans, of the Fuel Efficiency Committee, Mines Department, will open a discussion on "Efficiency in the Use of Fuel."

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Institution Membership

IT is not clear from Mr. T. H. Carr's letter in your Jan. 2nd issue whether he is endeavouring to express sympathy with I.E.E. Graduates who find it difficult to impress employers that they have engineering training, or whether he is indulging in a cheap sneer. The wording of his letter favours the latter interpretation.

If an applicant for a position is a Graduate why should he not make the most of the fact? Mr. Carr says he knows of members of the clerical profession who are Graduates. Is he by any chance referring to estimating engineers, because if he is let me inform him that many of them can solve an engineering problem while corporate Members, in considering the same problem, sit with the tips of their fingers together, assume an expression of profound thought and remain so with their heads in the clouds for an unconscionable time.

By all means safeguard the profession, but let us be guided by a sense of proportion and not look down our noses at Graduates upon whom, after all, and to a large extent, depends the reputation of the electrical engineering profession generally.

Middleton. PUNCTILIO.

Machine-Tool Motors

WE wish to draw your attention to an error which appears in the article on page 735 of your issue of December 26th. Dealing with the speed control of motors, the multi-section rectifier method is referred to as an alternative to Ward-Leonard sets, and in spite of the phrase "multi-section rectifier" being specifically used, the paragraph continues "in this the speed range is limited owing to the constant rectifier drop which reaches a high proportion of the output voltage at very low motor speeds."

This is not so; the reason for providing the rectifier in a multi-section fashion is to avoid the constant rectifier drop, and the principle of tapping the rectifier in this way makes it possible to provide a constant rectifier efficiency and constant rectifier percentage regulation, a thing which is impossible with Ward-Leonard control.

This means that the rectifier method enables the speed range to be even greater, and a better low-speed performance given, than that obtainable with small Ward-Leonard sets, and it was for this reason that the rectifier system supplanted the Ward-Leonard system in such applications as driving work-head motors of grinders.

The last sentence of this paragraph is also incorrect; a shunt regulator is never used to give control between the voltage steps as it has not been found practicable to adopt this, on account of the inherent limitations of the motor. Instead, rectifier circuits have been developed and patented so that any desired number of speed steps can be provided, with simple standard switches, according to the user's requirements. In the past, six such steps have commonly sufficed, but such rectifiers are now being supplied with eighteen and thirty-six steps, and even more can readily be provided should they be considered desirable.

WESTINGHOUSE BRAKE & SIGNAL CO., LTD.
*London, N.*1. L. H. PETER,
Chief Electrical Engineer.

Engineers' Salaries

CORRESPONDENCE in recent issues of the REVIEW has indicated the growing realisation by the engineers on the staffs of engineering manufacturers, of the necessity for them to amalgamate into some form of organisation, to protect their interests. To name three such classes I might mention designers, estimators and the engineers in contracts departments.

"Designing Engineer," in your issue of December 19th, suggested some form of federation, and I thoroughly endorse his remarks. The immediate necessity is action, and it occurs to me that some of the existing societies or unions may already have some section which covers such engineers as I have mentioned.

May I therefore invoke your assistance by asking the secretaries of any such society or union to communicate with the REVIEW. And, finally, I would warn engineers of the dangers of lethargy in these matters and urge them to consider wholehearted co-operation in their own vital interests.

Manchester. ESTIMATING ENGINEER.

Indian Telephone Project

IT is reported in *Indian Engineering*, that an agreement has been arrived at between the Government of India and the Nizam's Government whereby Hyderabad State will shortly be linked with British India on the trunk telephone system. The Nizam's Government also has under consideration a scheme involving an expenditure of Rs. 24,00,000, spread over five years, to link up important business centres in the State by means of trunk lines and also to introduce a telephone system for local use in twenty-six important districts of the State.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IN addition to the names published last week of men who have received awards in the New Year Honours List, **Mr. A. H. Fay,** A.M.I.E.E., installation engineer, of the Manchester Corporation Electricity Department, has been awarded the British Empire Medal for meritorious service with the Royal Observer Corps.

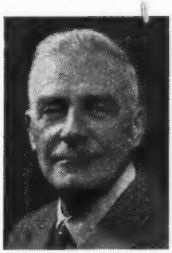
The New Year Honours also included **Captain J. Temple Hazell,** A.M.I.E.E., of the 56th Kent Home Guard, who receives the M.B.E. Captain Hazell is personal assistant to Mr. P. V. Hunter, C.B.E., chief engineer and joint manager of Callender's Cable & Construction Co., Ltd. Since the inception of the Home Guard Captain Hazell has concentrated on bombing, and the intensive training of men in the use of grenades of every description; he is the Zone Bombing Officer for one of the London District zones.

Mr. G. C. Usher

We reproduce herewith the portrait of **Mr. George C. Usher,** Director-General of Tank Supply, who, as we have already reported, has received a knighthood.

Mr. W. Tyldesley, secretary, and **Mr. J. W. Davies,** general works manager, have been elected to the board of Ferranti, Ltd. **Mr. J. Clarke,** A.I.C.S., assistant secretary, has been appointed secretary.

Mr. Davies has spent forty-two years in the company's service, starting as a toolmaker in 1899. He was promoted in turn to foreman and departmental works manager, and was appointed general works manager in 1924, since when he has been responsible for large extensions in the company's manufacturing capacity. He has lately been elected vice-president (Manchester District) of the Engineering Employers' Association after many years' service as a member of the Executive Committee. He is a founder member of the Institute of Production Engineers and a member of the Executive Committee, Manchester Section. Always a keen supporter of the activities of the National "Safety First" Association (now the Royal Society for the Prevention of Accidents), he has for some years been vice-chairman of the Manchester Industrial Section.



Mr. J. W. Davies

Mr. Tyldesley joined the accountancy staff of Ferranti, Ltd., in 1903 from W. T. Glover & Co., Ltd. He became chief accountant in 1905 and was appointed secretary in 1929. He is a member of the famous Lancashire cricketing family, and was himself, in his younger days, a keen cricketer who made a name in Lancashire Club Cricket as a stumper for Worsley. He is a Fellow of the Chartered Institute of Secretaries.

Mr. Clarke, who was born in 1891, has spent all his business life in Ferranti's service. After early experience as a correspondent in the Sales Department, he became personal secretary first to the late Dr. S. Z. de Ferranti, and later to Mr. V. Z. de Ferranti, the present chairman of the company. Latterly he has filled the office of registrar and assistant secretary.

Mr. G. D. Johnstone, who has been appointed secretary to the West Gloucestershire Power Co., Ltd., and to the Chepstow Electric Lighting & Power Co., Ltd., has for the past 2½ years been chief accountant to these companies. Prior to joining them in 1939 he was senior assistant to Blackburns, Coates & Co., and under the direction of Sir Leonard Coates was for the greater part of 1938 and early 1939 engaged on the reorganisation of the municipal accounts system for Leeds Corporation. Mr. Johnstone qualified as an accountant at Carlisle and after practising there for a short period went to Leeds in 1933. He has been associated in many large-scale industrial reorganisations and investigations.

Mr. J. Bailey, head sales engineer and manager and technical adviser to Brook Motors, Ltd., has been appointed Area Electrical Adviser to the Directorate of Industrial Electrical Equipment, under the Machine Tool Control, Ministry of Supply, for the East and West Ridings of Yorkshire. This appointment follows upon the resignation of Mr. L. G. Bryden and takes effect from January 1st.

Mr. R. S. Wright, M.I.E.E., managing director of Newton & Wright, Ltd., has just completed fifty years' continuous service with the company.

Mr. W. Tyldesley

Mr. J. Clarke

The occasion afforded an opportunity for expressing the esteem in which he is held by the whole of the staff, and at a recent gathering in the works canteen, attended also by Mrs. Wright, a presentation was made to mark the occasion. In acknowledging the gift, Mr. Wright mentioned that the firm could trace its history back to 1704,

and that the founder was a relation of Sir Isaac Newton.

More than thirty members of the present staff have been with the company for over twenty years, and one of them has a record of sixty-four years' service. It was Mr. Wright's interest in X-rays which led to the rapid development of the business. He took his first radiograph within a few weeks of the discovery in 1895, and was present at the inaugural meeting of the Röntgen Society.

Mr. A. N. E. McHaffie has been appointed secretary of the British Thomson-Houston Co., Ltd., in succession to Mr. F. Fraser, whose retirement at the end of 1941 was reported in last week's issue.

Mr. McHaffie is a native of Rugby, and was educated at Watson's College and the University, Edinburgh. He qualified as a chartered accountant in 1924 and then went to India where he spent fourteen years in the service of Shaw Wallace & Co. in Calcutta and Bombay. On returning to England in 1939 he joined the Associated Electrical Industries group as manager of the Electrical Manufacturers' Finance Co., Ltd., and during the past eighteen months he has also acted as secretary of the Hotpoint Electric Appliance Co., Ltd.

Mr. F. D. Ascoli, deputy controller of rubber, has been appointed controller. The Rubber Control Board is to continue in an advisory capacity to the Ministry of Supply.

Mr. A. G. Forgan, station superintendent, Great Yarmouth, has been appointed power station superintendent at the Foss Islands power station of the York City Council.

Barnoldswick Council has agreed to release **Mr. J. Bailey,** electrical engineer and manager, for a post under the Air Ministry.

Manchester City Council has voted an increase of £250 per annum to **Mr. R. Stuart Pilcher,** manager of the Transport Department, making his salary £2,500.

Flying Officer G. R. Scorer, B.Sc., who was recently awarded the D.F.C. is on the technical staff of Meldrums Ltd., engineers, Timperley, Cheshire.

Mr. G. Barnard, M.I.E.E., who has been advisory director and engineer and manager of the Midland District Contracts Department of Callender's Cable & Construction Co., Ltd., has just retired from the active management of the department. He carried out pioneer work in the electrical industry in the early 'eighties in Belgium, France, Italy and Germany, before going to the Midlands in 1890. Mr. Barnard, whose services will be retained as an advisory director, has been presented by his fellow directors with a motor-car.

Mr. M. W. Wilson has been elected a director of the British Columbia Power Corporation to fill the vacancy caused by the death of Sir Herbert Holt. Mr. Wilson is chairman of the British Supply Council in North America and president of the Royal Bank of Canada.

Mr. W. R. Elliott, borough electrical engineer of East Ham, was recently congratulated by the Council upon his appointment as president of the Associated Municipal Electrical Engineers. He is also chairman of the South-Eastern Centre of the I.M.E.A.

Obituary

Mr. E. Jarvis.—We regret to record the death recently, after a short illness, of Mr. Edward Jarvis, who was in his eighty-third year. About twenty-five years ago Mr. Jarvis became a representative for the Edison Swan Electric Co., Ltd., in the Brighton area, where for some years he served on the Town Council.

Mr. J. A. Smith.—The death occurred recently at Huyton, at the age of sixty, of Mr. John Alexander Smith, who for many years was station engineer at the former Frindsbury power station of the Kent Electric Power Co. He was with British Insulated Cables, Ltd., and later became contracts manager of the Macintosh Cable Co.

Mr. Earl E. Whitehorn, editor of our American contemporary *Electrical Contracting*, who was formerly with the *Electrical World*, died recently at Caldwell, New Jersey.

Mrs. E. Hertz.—The death occurred at Cambridge recently of Mrs. Elisabeth Hertz, widow of Professor Heinrich Hertz whose name is associated with the Hertzian waves and the unit of radio-frequency, the kilohertz. She was in her seventy-eighth year. Heinrich Hertz died in 1894 at the early age of thirty-six.

Will.—Mr. George Balfour, chairman of the London Power Co., the Lancashire Electric Light & Power Co., the Midland Counties Electric Supply Co., and a number of other electricity supply companies, left £191,591, with net personalty £156,277.

Engineering Training

SPEAKING at Newcastle-upon-Tyne on Friday last week Mr. F. H. Reid, B.Sc., Principal of the Sunderland Technical College, suggested that the period of apprenticeship in the engineering industry should be reduced. Mr. Reid, who was addressing the North-East Coast Institution of Engineers and Shipbu lders on the subject of "The Training of Craftsmen in the Engineering Industry," said that the apprenticeship period could be cut down under a system of scientific training in technical schools, and he considered that there should be no loss of wages for the time spent in colleges. He proposed that during a three months' probationary period practical instruction should be given in a properly equipped and staffed training workshop at a technical college, and that the boys' general education should be continued by means of selected classes at the technical college.

Boys who had acquired certain training and skill in junior technical schools should be exempt from the probationary period. They should be credited with eight months of their apprenticeship immediately on entering the works. On completion of a three-year course of part-time day and evening study, the apprentices should be credited with an ordinary national certificate in engineering.

Wartime Meters

Uses for Uncertified Types

By J. E. N. Ashworth, A.M.I.E.E.

SINCE the introduction of the Electricity Supply (Meters) Act of 1936 many test departments have put quantities of meters on one side because they are of old types which have not been approved. Many of these could be used during the war for departmental costing purposes in the electricity or other corporation departments or on consumers' premises as certified meters are necessary only for registering energy for which the undertaking receives payment. Approved meters now in use for these purposes can with advantage be replaced and used elsewhere.

In many "safe" areas where there has been an influx of population since the war started, there has arisen a considerable demand for the hiring of prepayment meters to be fixed in rooms occupied by sub-tenants wishing to use a small cooker or fire and at the same time to recompense the householder. For this purpose unapproved types may conveniently be used. Many undertakings are accumulating a surplus of 5-A single-phase meters of both ordinary and prepayment patterns, due to consumers having transferred to some type of "all-in" tariff which requires one large meter only per consumer.

Certain 5-A prepayment meters are suitable for use as sub-meters for loads not exceeding 2 kW at 230 V; it is advisable to obliterate the existing "5 ampere" marking, and stamp "5-10 amperes" on the dial plate. Sangamo 5-A prepayment meters of types HC, HE and HM have series coils wound with 15 s.w.g. wire, and have exceptionally good overload capacity, the error at 10 A is rarely more than 0.2 per cent. slower than at full load. If the meters have been used previously for lighting purposes the price-change compound will require alteration. These series coils will carry considerably more than 10 A without overheating, many 10-A meters being in use with even smaller coils.

Another meter suitable for the same use is the Smith AP variable-tariff prepayment meter; a decided advantage is that the price per kWh can quickly be altered to suit the new conditions without the use of change-wheels or compounds. The 5-A meters of this type made before 1933 have series coils wound with 0.059 in. by 0.066 in. copper strip, which is very liberal, but if the load exceeds 8 A the accuracy falls off. These meters should be restricted to maximum loads of 2 kW and the errors can be adjusted to the loading as follows:—2½ A, 1.5 per cent. +; 5 A, 1.2 per cent. +; 8 A, 0.5 per cent. +; 10 A, 2.0 per cent. −.

In meters of this type made after 1933 smaller series coils were fitted, wound with 0.03 in. by 0.066 in. copper strip, but at the same time the overload characteristics have been improved, the accuracy curve now being flat up to 200 per cent. load. As the loads at which sub-meters will be required to operate can be foretold fairly accurately, it is not difficult to find places where these 5-A meters will be adequate.

If there is a surplus of ordinary 5-A meters, but a shortage of 20-A meters, the advisability of converting some of the former to the larger size should be considered. Particularly

C. & H. TYPE A1 METER TRAIN, 5 AMP., 2,400 revs. per kWh.

Component.	*Gear.*	*Revs. per kWh.*
A. Rotor	10-tooth pinion	2,400
B. Vertical spindle	120-tooth gear and single worm	$10/120 \times 2{,}400 = 200$
C. First change spindle	80-tooth gear and 26-tooth change wheel	$1/80 \times 200 = 2\frac{1}{2}$
D. Second change spindle (1/10 unit spindle)	65-tooth change wheel	$26/65 \times 2\frac{1}{2} = 1$

CONVERSION TO 20 AMP., 600 revs. per kWh.

Component.	*Gear.*	*Revs. per kWh.*
A. Rotor	10-tooth pinion	600
B. Vertical spindle	120-tooth gear and single worm	$10/120 \times 600 = 50$
C. First change spindle	80-tooth gear and 56-tooth change wheel	$1/80 \times 50 = 5/8$
D. Second change spindle (1/10 unit spindle)	35-tooth change wheel	$56/35 \times 5/8 = 1$

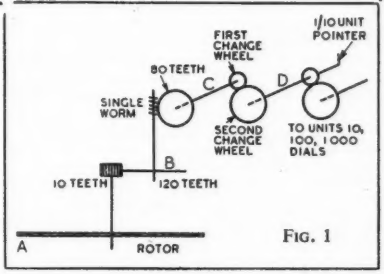


FIG. 1

suitable for this operation is the C. & H. type A1. As 5-A meters of this design have no 1/100 kWh testing dial, a long-period dial test of 10 kWh is necessary in order to comply with the requirements of the Act of 1936. This test alone occupies the test-bench for nearly nine hours, whereas a test on 5-A meters that are fitted with 1/100 kWh dials will be finished in less than an hour, since an advance of one kWh satisfies requirements. The conversion is quite simple, and necessitates only the rewinding of the series magnet with heavier wire and fitting a new data plate and two new change-wheel spindles in the train; the existing dial plate requires no alteration.

MEASUREMENT TYPE Z METER TRAIN, 5 AMP., 1,000 revs. per kWh.

Component.	*Gear.*	*Revs. per kWh.*
A. Rotor	Single worm	1,000
B. First-change spindle	50-tooth gear and 40-tooth change wheel	1/50×1,000=20
C. Second-change spindle (1/100 unit spindle)	80-tooth change wheel	40/80×20 =10

CONVERSION TO 20 AMP., 250 revs. per kWh.

Component.	*Gear.*	*Revs. per kWh.*
A. Rotor	Single worm	250
B. First-change spindle	50-tooth gear and 20-tooth change wheel	1/50×250 =5
C. Second-change spindle (1/10 unit spindle)	100-tooth change wheel	20/100×5 =1

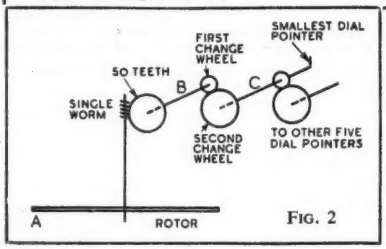


FIG. 2

A type A1 5-A 2,400 revolutions per kWh meter in the 230–250-V range has 40 turns of 18 s.w.g. wire, 20 turns on each limb of the U-shaped series magnet. In order to carry out the conversion, remove the meter element from the case and take out the rotor; then measure the width of the air-gap between the electro-magnets by means of a wedge-shaped piece of card so as to enable the correct alignment to be obtained when replacing the series magnet. The old series magnets can be returned to the makers to be rewound for 20-A loads (10 turns of 13 s.w.g. wire, 5 turns per limb). It is handier, however, to obtain a few new series magnets already wound with the larger wire to avoid delay in reassembling the meters. The new magnet should be replaced in the meter in exactly the same position as the old one or there may be difficulty in recalibration, hence the use of the gauge mentioned above; if replaced unsymmetrically, creeping either forwards or backwards on shunt will occur and, of course, too wide a gap will make the meter slow and *vice versa*. The existing data plate marked "5 amperes, 2,400 revs. per kWh" will require to be replaced by one marked "20 amperes, 600 revs. per kWh."

These meters have a 10-tooth pinion at the top of the rotor spindle driving a 120-tooth gear wheel at the back of the train (see fig. 1). A single worm on the staff of the latter drives an 80-tooth wheel on the first-change spindle. The change wheel on this drives the change wheel on the second-change staff, which also carries the red "1/10 kWh" (1 rev. per kWh) pointer. Change wheels for a 5-A meter (2,400 revs. per kWh) have 26 and 65 teeth; these have to be replaced by spindles carrying 56 and 35 teeth for use in a 20-A meter.

This conversion has also been applied to other types of meter, such as the Measurement Type Z long-range meter (see fig. 2), but as the 5-A meter has 1,000, 100, 10, 1, 0.1 and 0.01 kWh dials, and the 20-A meter has 10,000, 1,000, 100, 10, 1 and 0.1 kWh dials, it is necessary in this case also to change the dial plate.

The change-wheels are 40/80 for a 5-A meter and 20/100 for a 20-A meter. In each case the single worm on the rotor spindle drives a 50-tooth wheel on the first change-spindle; this in turn drives the second change-wheel staff which also carries the pointer of the smallest dial.

Women Welders

THE January issue of the "Engineering Bulletin" produced by the Ministry of Labour, gives some particulars of the training of women as arc welders at the County Technical College, Wednesbury. The work done by these women is mainly bench work and jobs held in jigs, and men formerly employed on these tasks have been freed for heavier work.

Once they have overcome their natural timidity attendant upon the pyrotechnic display the majority do well; only a few fail to conquer their distrust of the spluttering arc. Tests are arranged at the end of the second, fourth and sixth weeks of the course.

The "Bulletin" also describes the employment of women in fitting and assembly work and in the rebuilding of road vehicles. Another article, by Dr. W. McLaine, assistant general secretary of the A.E.U., deals with common causes of "hold-ups" in the shops and makes suggestions for avoiding them.

The Work of E.R.A.

Normal Researches Continuing

DURING the twelve months ended September 30th, 1941, the British Electrical and Allied Industries Research Association, not only proceeded with most of its normal work, but actually augmented its special war researches.

In a foreword to the annual report Mr. C. W. Marshall, in his second year as chairman of the Council, expresses confident expectation that continuing switchgear investigations will provide guidance for future developments of equal value to that already afforded. What is known as the " hard " gas circuit-breaker is receiving special attention in view of the vapour given off by vulcanised fibre and other organic insulating materials when kept in contact with an arc. This property can be taken advantage of by causing the gas so produced to form a blast for extinguishing the arc. Tests with a simplified air-blast breaker have thrown light upon the effects of changing contact dimensions and other features of air escape passage ways. Further work is in hand relative to the system voltages set up when fluid-blast switches clear small currents in inductive circuits.

Battery Studies

The war having focused attention on the urgent need for better means of storing electrical energy, an exact investigation was commenced of the most promising possibilities of improving batteries, with particular reference to accumulators for transport requirements. Professor Egerton is directing studies at the Imperial College of Science with a broad view not only to lengthening the life and raising the efficiency of cells, but also to the possible discovery of some novel means of storage.

Another of the chairman's references is to the unprecedented stresses to which electrical plant in this country has been subjected due to power system faults brought about by enemy action. Consequent accentuation of the seriousness of the old problem of mechanical forces applied to transformer windings when short circuits occur has led to the formation of a new section which will also deal with the improvement of transformer iron quality, particularly with regard to energy losses, the importance of which is enhanced by the successful production elsewhere of iron for such purposes which is materially better than that available to British manufacturers at the present time.

Steam Topics

Researches into the properties of steam at high temperatures and pressures, which was a major item in the E.R.A. programme for many years, have been brought to a close. But investigation of the properties of metals used in the manufacture of steam plant continues with full activity. Although work on condenser tube corrosion has suffered some temporary disturbance owing to enemy action, recommendations have been made for the utilisation of ferrous tubes in the event of the supply of non-ferrous metals being limited, with due regard for their smaller coefficient of heat transfer and lesser vacuum maintainable. Apparently capricious results attending remedial measures so far tried have suggested the existence of some underlying cause, as yet undiscovered, of vibration in power station steam pipework.

A New Camera

Fuses in AC circuits can be made to " blow " before the maximum current has been reached, with advantage in respect of the stresses the fuse designer has to cater for and those the user's plant must withstand. Exploration of the possibility of reducing the pre-arcing energy has led to the development of a new piece of apparatus specially for this work, though it is of much wider application. It comprises a high-speed camera, simple and robust, for speeds up to at least 1,000 pictures per second with provision for recording a cathode-ray oscillogram simultaneously on the same film, thus simplifying identification and correlation.

Effects of pressure piling within motor enclosures upon safe clearances between shafts and glands of machines in coal mines are being studied in co-operation with the Safety in Mines Research Board, as is also the relation between static and dynamic pressures in flameproof enclosures.

In respect of flameproofing tests for industrial plant, a fresh programme adopted covers a further ten gases additional to the first series tested. This work has assumed greater importance owing to the demand in wartime for electrical gear to operate in new industrial processes, results being urgently required by Government Departments.

Magnetic Materials

Magnetic material researches under the direction of Professor Sir Lawrence Bragg at Cambridge continue in the same general directions as previously, but their scope has become broader to permit of more attention being paid to factors of practical importance. Likewise Professor Sucksmith has extended his magnetic inquiries at Bristol. Production efforts in co-operation with the Permanent Magnet Association have included investigations of the new " Alcomax " alloy, which possesses such exceptional magnetic properties in the direction of the magnetic length after cooling in a magnetic field. The work being

conducted at the National Physical Laboratory has been somewhat delayed by demands connected with the war, but apparatus has been constructed and investigation of the stability of magnets has started.

Fundamental research into the properties of dielectrics continues as opportunity occurs. The resources of the E.R.A. laboratory for work on radio interference suppression have been largely occupied by the requirements of the Services, and the war has prevented any appreciable activity in respect of inductive interference with communication circuits, apart from advice and consultation and the loan of apparatus. In several departments some work has suffered delay owing to wartime preoccupations of a more urgent nature, or to diversion of investigators to country work, for example in agriculture and horticulture; the efforts of E.R.A. in this direction are beginning to receive deserved recognition.

There is much about which it is not permissible to disclose details. Staff changes have been relatively few; on the technical side relief has been afforded by the absorption of an increasing number of friendly aliens of good standing and technical ability. The increasing number of inquiries attended to by the E.R.A. information bureau and library reflects the value of the services rendered.

INSTITUTION PROCEEDINGS

Electric Heating Installations. Efficient Use of Coal.

Large-Scale Heating

VARIOUS methods of applying electricity on a large scale, particularly to space warming and water heating, as well as for sundry special purposes, including a new design of Russian and Turkish baths and thermal storage for cooling purposes, were discussed in a paper by Mr. W. Gilchrist (Central London Electricity, Ltd.) submitted to the Installations Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 15th.

Reference was made to the possible economic limits of utilising electricity for direct heating, relating them to the capacities of both commercial and domestic buildings. The conclusions reached were formed from basic heat calculations and the results obtained from a number of installations, a few examples of which were briefly described. It was not the author's intention to detail design, or to elaborate on the electrical apparatus, switchgear, controls, etc., embodied therein. His object was rather to place on record broadly the fundamental principles of design and some of the results obtained from certain methods of applying heat which, in some respects, did not altogether conform to existing practice.

Limit to Size

Details were included of certain combinations of radiant and convection heating which were claimed to achieve the maximum comfort conditions at a lower cost to the consumer and supplier of electricity than other methods at present in use. Examples cited of installations carried out on this basis represented combinations of thermal storage with local thermal storage and direct heating. Details were also given of water heating on a large scale according to a method which had considerably improved the overall efficiency as compared with present systems.

Summarising the conclusions reached from the experience outlined in his paper, the author maintained that from the points of view of the consumer and supplier of electricity there was a definite limit to the size of installation that should be provided for central heating by direct electricity in ordinary commercial buildings. Thermal storage for either large commercial or domestic buildings (blocks of flats) should be applied with discretion in relation to the cost of distributing electricity to such plant.

Combined Systems

In specialised buildings (stores, restaurants, cinemas, theatres) in which ventilation conditions varied, a combination of thermal storage with direct heating would afford better comfort in relation to annual cost than any other electrical method, in many cases justifying the use of electricity to the exclusion of all other fuels. Large-scale panel heating, which meant continuous warming, had not been proved satisfactory; research was needed into the relative merits of continuous and intermittent heating. Short off-peak heating must cover a period of four hours, present systems being unsatisfactory.

Large-scale water heating must be done by combining thermal storage with supplementary units in order to obtain such efficiencies as would allow of economic application; the effects of high temperature water (up to 300 deg. F.) needed to be investigated. Research into certain applications of the heat pump might show how to bring about savings that would justify a considerable extension of the limited use now made of this important factor.

Finally, in briefly outlining a policy of domestic electrification the author expressed his belief that future procedure should be based on the use of a proportion of solid fuel in winter for both room warming and water

heating in working-class homes (houses and flats) of which there were nine millions. Moreover he did not recommend complete electrification of middle-class households, of which there were three millions.

Management of Protective Gear

PRACTICAL as well as theoretical considerations affecting the management of protective gear on power supply systems were dealt with in a paper by Messrs. W. Casson and F. H. Birch (Central Electricity Board) that was read at a joint meeting of the Transmission and Meter and Instrument Sections of the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 14th.

The aim of the paper was to present in a convenient form an outline of those factors which had a bearing on the subject, and to draw attention to the importance of effective co-operation between power station protective gear engineers and the design and manufacturing side of the industry. Only by the mutual understanding of difficulties and the free exchange of experience and ideas could the best results be obtained.

After reviewing the extent of the responsibilities and qualifications of protective gear engineers, a number of typical system fault conditions were investigated, methods of calculating fault currents and voltages being given in each case, while the relationships between them were illustrated by vector diagrams. System abnormalities other than faults and their relation to protective gear operation were also discussed, while mention was made of certain characteristics of protective gear which affected its performance and correct application.

Testing Methods

There were both a general outline and detailed consideration of the work that should be carried out on protective gear of various types before it was commissioned, including a description of general methods of testing and of testing equipment. The penultimate section of the paper was devoted to protective gear troubles and routine maintenance procedure. The last section discussed certain features of design, construction and layout which assisted maintenance.

Finally it was considered that sufficient experience had now been obtained to permit some measure of standardisation, which would benefit gear manufacturers as well as supply authorities. A few of the items which it was considered might be standardised included the time-current characteristic and the current and time settings of simple inductive current-operated relays, as well as the way in which relay flag indicators distinguished between the operated and normal relay positions.

Although attempts had been made to regularise the colour code used in small wiring, there were still wide divergencies between the practices adopted by various manufacturers; an elaborate code was both unnecessary and undesirable. It was realised that there were difficulties about the reference numbers for wires and cables, but even some incomplete measure of standardisation would be of great value to protective gear engineers. Likewise symbols used on layout and schematic wiring diagrams needed attention, one example of the way in which the Central Electricity Board had standardised certain basic circuits being illustrated diagrammatically. Links and fuses were provided in the DC circuits to facilitate routine maintenance and the location of defects. Brevity in labelling the fuses and links was obtained by the use of standard identification symbols.

Coal Economy

A MEETING of about 300 members of ten engineering and allied institutions was held on January 8th at the Institution of Electrical Engineers for the purpose of discussing means of improving efficiency in the use of fuel and power in existing industrial plants under present conditions. This was one of a series of discussions arranged in various parts of the country at the request of the Mines Department by the INSTITUTE OF FUEL through its secretary, Mr. P. C. Pope, with a view to eliciting constructive suggestions from technical men. The conference was inaugurated by Mr. D. R. Grenfell, M.P., Secretary for Mines, who had at the preceding luncheon asked for the co-operation of technical men with his Department in securing an immediate saving of ten million tons of coal per annum, an appeal to which Mr. W. M. Selvey (President, Inst. Fuel) had responded in appropriate vein.

The target aimed at, Mr. Grenfell said, represented a saving of about 4½ per cent. of the coal won, and coal was at the foundation of the entire war effort. Britain with its twenty-seven coalfields was the richest source of crude fuel for its size in the world and the second largest producer. Within the lifetime of many of those present there had been a very remarkable increase in the efficiency of coal utilisation but further improvements would be required during the next few months and with the use of inferior fuels.

One-Twelfth of National Income

Sir Harold Hartley, chairman of the Fuel Research Board, who presided, remarked that it was the first time that ten senior technical institutions had met together to consider a national problem. He showed that, in 1936, the value of the coal raised was £450 million or one-twelfth of the gross national income and in 1938 its transport involved one-half of the net ton-miles of haulage. Between 1913 and 1938 the population had increased by 10 per cent.,

but only 4 per cent. more fuel was used owing to better economy in its use.

In opening the discussion Dr. E. S. Grumell, chairman of the Fuel Efficiency Committee of the Mines Department, expressed the view that half the saving aimed at could be made before the generation of heat and the balance after. Economy in use enabled other economies to be made; *e.g.*, it took 5½ tons of coal to raise each 100 tons. The total saving aimed at would save 500 million train miles and would release upwards of 30,000 ten-ton wagons and would be equivalent to the output of 30,000 men. Methods adopted for avoiding waste now could be of permanent value. Waste was often due to lack of interest in fuel economy on the part of managers, possibly because coal had been too cheap, and few concerns retained fuel experts as distinct from ordinary engineers.

Reduced Number of Grades

The results of research could no longer be kept secret. Standardisation of equipment and full information as to the kind of mechanical stokers and the amount of draught for different grades of coal was required. The number of grades and sizes of coal must also be reduced. Pulverised-fuel firing suggested itself as the best way of using fine slack, but if this were not so, the correct solution should be found. He considered that difficulties with the use of unfamiliar coal were often due to incomplete adaptation rather than to unsuitability.

Later speakers were agreed upon the need for greater "coal-economy consciousness" among industrial administrators in order to lead them to value specialist help, which need not be whole-time. In view of the present paucity of consultants, the services of the Mines Department or of the Coal Utilisation Council could be made available. Each industry was urged to form its own fuel-efficiency committee. Coal shortage, it was pointed out, might be due to four causes: *viz.*, insufficient total quantity raised, unbalancing of grade and demand, geographical (due to transport difficulties) and temporary (*e.g.*, due to enemy action).

Banking Losses

One common source of waste, it was stated, was the banking of small boilers, often for sixteen out of twenty-four hours, which accounted for more than 10 per cent. of the total used by them. The amount could be greatly lessened by preventing air leakage through dampers and brickwork and by providing adequate lagging and, where circumstances permitted, mechanical draught, economisers and a few degrees of superheat. The importance of taking the staff into confidence in the means adopted for promoting fuel economy and training boiler operators was also emphasised.

For steam raising on a larger scale, the greatest obstacle to economy, it was submitted, was not so much the poor quality of coal now being delivered as frequent variations in its characteristics. This caused an increase in consumption by as much as one-third in one important electric generating station where, of 100 tons of coal delivered, 15 tons was said to be of incombustible matter and 15 of water; moreover, a large proportion had to be transported from the other end of the country. The additional ash had to be taken away, the water had to be evaporated and the boilers became dirty and more of them had to be steamed, all involving labour as well as inefficiency.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, January 22nd, 5 p.m. London. Papers: "A Totally Electrified Cane Sugar Factory," by Mr. L. B. Whitaker, and "Electricity in a Beet Sugar Factory," by Mr. B. Smith.

Wireless Section.—Tuesday, January 27th, 5 p.m. London. Informal meeting.

West Wales (Swansea) Sub-Centre.—Saturday, January 17th. 3 p.m. Chamber of Commerce Exchange Building, Swansea. Paper: "The Lightning Discharge," by Messrs. C. E. R. Bruce, M.A., B.Sc., and R. H. Golde (E.R.A.).

North Midland Centre.—Saturday, January 17th, 2.30 p.m. Hotel Metropole, King Street, Leeds. Paper: "Voice-Frequency Signalling and Dialling in Long-Distance Telephony," by Messrs. W. G. Radley, Ph.D. (Eng.) and E. P. G. Wright.

Mersey and North Wales (Liverpool) Centre.—Monday, January 19th, 5 p.m. Liverpool Royal Institution, Colquitt Street. Paper: "The Electricity Supply (Meters) Act, 1936—Its Legal and Technical Implications," by Mr. Alwyn Evans.

North-Western Centre.—Saturday, January 24th, 2.30 p.m. Engineers' Club, Albert Square, Manchester. Joint meeting with the Institution of Post Office Electrical Engineers. Papers: "Metal Rectifiers," by Messrs. A. C. Williams, Ph.D., M.Sc., and L. E. Thompson, B.Sc., and "The Characteristics and Applications of the Selenium Rectifier," by Mr. E. A. Richards, B.Sc.

Students' Section.—Saturday, January 17th, 2.30 p.m. Engineers' Club. Problems meeting.

North-Eastern Centre.—Monday, January 26th, 6.15 p.m. Neville Hall, Westgate Road, Newcastle-upon-Tyne. Paper: "The Management of Protective Gear on Power Supply Systems," by Messrs. W. Casson and F. H. Birch.

London Students' Section.—Monday, January 19th, 7 p.m. Paper: "Generation and Amplification of Micro-Waves," by Mr. F. Cox. Saturday, January 24th, 3 to 7.30 p.m. Lysbeth Hall, Soho Square, W.1. Tea dance. Tickets, 3s. 6d. single and 6s. 6d. double from Mr. E. M. Hickin, 57, Oldbrough Road, North Wembley.

Association of Supervising Electrical Engineers.—Saturday, January 17th, at 2.30 p.m. Lighting Service Bureau, Savoy Hill, London, W.C.2. Lecture: "The Application of Switchgear to Industrial Distribution Systems," by Mr. W. A. Brown, A.M.I.E.E.

Electrical Industries Benevolent Association.—*Northern Counties Area.*—Monday, January 26th, 3 p.m. Tilley's Restaurant, Blackett Street, Newcastle-upon-Tyne, 1. Annual general meeting under the chairmanship of Mr. E. J. Edgar.

Electro-Chemical Analysis–I

Gravimetric Electrolytic Methods

By R. H. Powell

In this first of two articles the author deals with the principles of quantitative determination of elements in solution by electrolytic methods, and describes types of electrodes used for the purpose

BY electro - chemical analysis is meant those processes of chemical analysis in which electrical methods are used to obtain results which by purely chemical methods are either slower, more laborious, or even impossible. It includes the quantitative determination of elements in solution by electrolytic deposition (gravimetric electrolytic analysis), volumetric analysis with electrical means of indicating the end-point (conductimetric and potentiometric titration) and the determination of pH values (potentiometric analysis, ELEC. REV., Oct. 24th, 1941, p. 425) together with other branches less highly developed at present, such as the determination of moisture (ELEC. REV., Feb. 28th, 1941, p. 413) by the measurement of capacitance.

Rapid and Accurate Methods

Gravimetric electrolytic methods are growing in favour for the rapid and accurate analysis of industrially important alloys. When a difference of potential is applied to electrodes immersed in a solution of salts, acids, or bases, electrical conduction is accompanied by changes of a chemical or physical nature. Faraday was the first to enunciate the laws by which the quantitative behaviour of ions in solution is expressed.

(i) The amount of change, or decomposition, is proportional to the current and to the time for which it passes.

(ii) The amounts of different substances liberated by the same current flowing for the same time are proportional to the electro-chemical equivalents of the substances.

Thus, if a pair of copper electrodes be immersed in a solution of copper sulphate and a current i be passed for a time t, and w_1 is the weight of copper transferred from the anode to the cathode, then by the first law $w_1 \propto i\,t$. Again, if a pair of silver electrodes is immersed in a solution of silver nitrate and w_2 is the weight of silver deposited by a current i for a time t, then $w_2 \propto i\,t$. Thus, by the second law, if $i\,t$ is the same in both cases, then w_1 is to w_2 as is the electro-chemical equivalent of copper to the electro-chemical equivalent of silver. It therefore follows that if the amount of any one element liberated by the passage through the solution of a given current in a given time be known, then the amount for any other element may be found provided that its chemical equivalent, which is the $\frac{\text{atomic weight}}{\text{valency}}$, be known. The mass of a substance liberated by the passage of one ampere flowing for one second (one coulomb) is called its electro-chemical equivalent. The most accurately measured electro-chemical equivalent is that of silver, 0·0011183, determined by Rayleigh (Dic. App. Physics II, p. 248, *et seq.*) in a silver voltameter. Ag = 107·88 Cu (divalent) = 63·57. Thus the electro-chemical equivalent of copper

$$= 0{\cdot}0011183 \times \frac{63{\cdot}57}{107{\cdot}88 \times 2} = 0{\cdot}000329$$

From this it will be seen that one gramme-equivalent of silver (107.88 gms.), or of divalent copper $\left(\frac{63{\cdot}57 \text{ gms.}}{2}\right)$ will be deposited by the same quantity of electricity. This quantity is the faraday ***F***, which is thus equal to 96,500 coulombs.

Minimum Decomposition Voltage

To determine the amount of a metal present in a solution it is not sufficient to measure only the values of current and time. There is, first, a minimum decomposition voltage below which current will not pass continuously through a solution. Suppose in a solution of normal sulphuric acid a pair of platinum electrodes be immersed in a cell C to which 0·5 V is applied (fig. 1). When K is depressed current flows momentarily through C, but rapidly falls to zero due to polarisation of the electrodes. On releasing K current flows through the galvanometer for a short period. Increasing the voltage shows that when it reaches 1·7 V polarisation is the maximum and the back EMF is also the maximum. Only values of EMF above 1·7 V are available for electrolysis and for the release in this cell of oxygen and hydrogen.

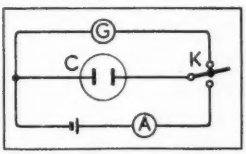


Fig. 1.—Elementary cell circuit illustrating polarisation voltage

Secondly, when, say, copper is being deposited from a solution of one of its salts, using a platinum anode and a platinum cathode, a progressive decrease in copper content of the electrolyte is being gradually brought about

and the decomposition voltage, being related to the concentration, changes accordingly. In the case under consideration reduction of the copper concentration to 1/10 of its initial value requires an increase in electrode potential of about 0·03 V to bring the metal out of solution. Generally, a decrease of 1/10 in the concentration of an ion in the electrolyte raises the decomposition voltage for that ion by $0{\cdot}058/m$ volt,

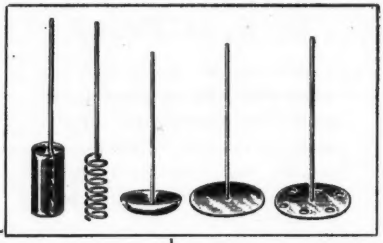
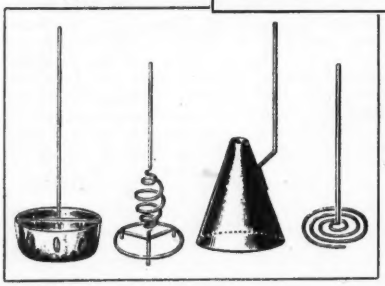


Fig. 2.—Anode electrodes shaped to induce electrolyte agitation



where m is the valency of the particular ion.

Thirdly, there is the difficulty of determining the exact moment when all the metal has been removed from solution. Internal indicators which signify the presence of an ion by a colour change are valueless in this respect since they depend for their indication upon reaction with the element under determination. External indicators must be used but do not lend themselves to exact timing. The suggestion has recently been made (Ind. Eng. Chem. 1941, *13*, 733) that the converse process, involving stripping of the deposit under controlled conditions, might hold possibilities for a completely automatic electro-analysis involving no weighing; but the traditional method, by which the increase in weight of the electrode is accurately determined by the use of an analytical balance, is so straightforward that reversal of the process can lead only to undesirable complications.

Fourthly, electrolytic analysis is normally adopted because of its convenience and rapidity. For rapid results current densities are employed which are as high as are consistent with the obtaining of adherent deposits. But with high current densities only part of the energy is used in actually depositing the metal, the other part being dissipated in the disengagement of electrolytic gas. Though this dissipation may be reduced by various means, as the sequel shows, it is not practicable to determine the value of that part of the current used in actual deposition as distinct from the production of electrolytic gas. For these reasons Faraday's laws cannot be applied practically to electro-chemical analysis as practised to-day, though his investigations laid the foundation on which the subject is built.

Since each element has a definite electro-deposition potential, by controlling the cathode voltage it should be possible to separate the different constituents of a mixed electrolyte. When, for example, the concentration of copper in a mixture of copper and nickel sulphates has become so low that the decomposition voltage of the dilute solution approaches that of the nickel, further increase of potential will bring about deposition of the nickel. In the case of nickel and cobalt, their

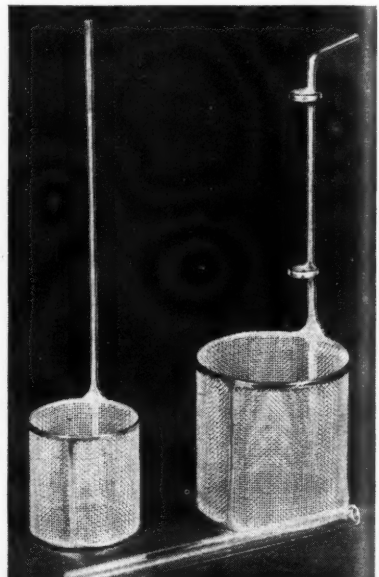


Fig. 3.—Fischer type platinum electrodes made by jig stamping

deposition potentials are so close that separation of the metals as such cannot be brought about by this means; and resort must be had

to other means. In this case one method suggested (Torrance: Analyst, 1939, *64*, 109) is to deposit the cobalt as its oxide Co_2O_3 on the anode.

Removal by electrolysis of a metal from solution results in the layer of electrolyte in contact with the cathode becoming progressively decreased in concentration. Without artificial agitation of the electrolyte a stage is reached at which the rate of deposition is limited to the speed at which ions can diffuse from regions of higher concentration, through the attenuated layer of electrolyte about the cathode to the cathode itself. To accelerate the process spiral or helical wire anodes, dished anodes with the concave surface uppermost, and cylindrical or conical cathodes were introduced (fig. 2). With the anode fitting inside the cathode the gases liberated escape by passing up the inside of the cone, bringing about some measure of agitation of the electrolyte. Circulation of the electrolyte by the convection currents resulting from heating was also employed, when an elevated temperature was not otherwise precluded (in some methods for the determination of zinc, cooling by ice is necessary).

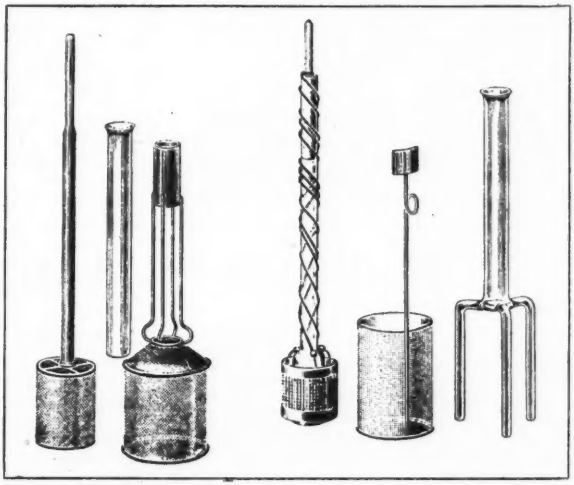


Fig. 4.—Sand type gauze electrodes with rotating stirrers

The first recorded use of artificial stirring was in 1886, when the improvement in electrolytic efficiency became immediately apparent. Experiment (Sand : Trans. Chem. Soc. 1907, *91*, 374) has shown that, under certain conditions, up to 60 per cent. of the current employed in an unstirred determination can be uselessly expended in the production of oxygen and hydrogen. This, while not entirely suppressed when the electrolyte is vigorously stirred, has yet been so largely reduced that, with the concomitant rapid renewal of the exhausted layer of electrolyte in contact with the cathode, the time required for some determinations has been reduced from 1 or 2 hours to 10 or 15 minutes. Vigorous agitation of the electrolyte is, therefore, essential in any efficient apparatus and modern designs tend to fall into three main classes.

First, the Fischer type of electrodes (Z. Elektrochem, 1907, *13*, 469), fig. 3, consist in their latest form of a cylindrical gauze platinum anode about 25 mm. diam. by 30 mm. tall, reinforced with bands of platinum foil or wire, and equipped with a platinum lead-in wire. The cathode is of similar material and construction, 38 mm. diam. by 38 mm. tall with a stout lead-in wire fitted with two rings in which the anode lead is located, being insulated therefrom by a short length of glass tube. A glass rod stirrer, with paddle or other suitably-shaped end, is rotated in the centre of the inner electrode and brings about the vigorous circulation upon which rapid analysis depends. So wide is the current application for electrochemical analysis that it has become worth while to design jigs and tools for stamping the frames of these electrodes from platinum sheet, which has the two-fold object of providing a square section frame, stronger than a frame built up from wire, and of reducing to two the number of welds at which failure of the frame can take place.

Secondly, there are Sand's electrodes (fig. 4) consisting of an outer reinforced stationary gauze electrode and an inner rotating electrode which also acts as a stirrer, being fitted diametrally with a blade which increases the stirring effect. It is stated that for efficiency of stirring and rapidity and smoothness of work these electrodes are probably superior to others that have been described. They do, however, require that the ancillary apparatus shall be designed to provide certainty of contact with up to 10 A at not more than 12 V. A mercury filled tube open at the top end and rotating with the electrode, with a stationary lead dipping into the free mercury surface, is most effective for ensuring the necessary reliability of contact and it is probably in the objections to this system that the explanation is to be found that the Sand type of electrode

has not up to date gained wider application.

It may be mentioned in this connection that the American Society for Testing Materials states in A.S.T.M. Designation B40–36T that in electrolytic analyses " the electrodes recommended are of the stationary and not of the rotating type, as the stationary require less of the operator's time, and there is less chance for erroneous results to be obtained than with the other kinds. Rapid and accurate results are obtained with stationary electrodes made from wire gauze."

Thirdly the Frary method (J. Amer. Chem. Soc. 1907, *29*, 1592) is an ingenious attempt to abolish the mechanical stirring devices. The electrodes are immersed in the electrolyte in a beaker surrounded by a solenoid carrying a large number of ampere turns. The magnetic field due to the solenoid is axial, and the magnetic field due to the radial lines of current through the solution between the electrodes has horizontal components at right angles to the axial field. Rotation of the electrolyte therefore ensues, which is vigorous when the current is large. It is, however, usually necessary to reduce the current towards the end of a determination and a diminished rotation of the electrolyte results. The rotation is not, therefore, readily controllable and though recent American practice has " rediscovered " the system and hailed it as the acme of perfection, it has found no great favour in this country.

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Machinery Control

Provisions of New Order

BRIEF reference was made last week to the new Machinery, Plant and Appliances (Control) Order, 1942, made by the Board of Trade. In general the Order follows the lines laid down in the previous Orders which it supersedes, but repetition may be desirable and useful.

It forbids the supply of goods included in the Order by any manufacturer who has carried out any "process of manufacture" upon them otherwise than to a person who has received a licence from the Board of Trade to acquire them. Supplies to Government Departments, for export, to other manufacturers of the controlled goods and to public utility undertakings (who have received the authorisation of another Government Department) are not affected by the Order. Exemption is also provided for fencing or other safety device; electro-medical apparatus supplied to a hospital, registered nursing home or patient on a doctor's certificate; goods solely for use with machinery or plant (other than controlled goods) made or in course of construction, supplied to the manufacturer of that machinery or plant; and parts for the purpose of repair of controlled goods.

A licence authorising the acquisition of any controlled goods of a kind driven by other machinery or plant authorises also the acquisition of any prime mover or electrical machinery or plant solely for use in driving the controlled equipment where no other driving means is available.

A manufacturer of controlled goods who, since July 31st, 1940, has acquired controlled goods under previous Orders is not permitted to use them otherwise than in circumstances in which he would be permitted to supply them if he had carried out a process in their manufacture. No controlled goods manufactured after July 31st, 1940, may be used by the manufacturer for industrial purposes.

The term " manufacture " includes reconditioning and the carrying out of any process of manufacture. Controlled goods include the machinery, plant and appliances specified in a schedule to the Order and any prime mover, electric generator (including control equipment) not exceeding 25 kW and any electric motor exceeding 5 HP but not exceeding 50 HP (including control equipment) " designed or appropriated for use in conjunction therewith and includes any parts thereof."

The schedule includes many classes of machinery used in manufacture (*e.g.*, bakery machinery and plant, food preparing machinery, bottling and capping machinery, paper-making machinery) which are very largely driven by electric motors.

It also covers the following directly electrical or allied items:—Cinematograph projection apparatus employing film 16 mm. or more in width (including sound-producing equipment for use therewith); electroplating machinery and plant; braiding machinery and plant; generators (including control equipment) of more than 25 kW; heavy and medium switchgear (rated at 500 A, 660 V or more); motors (including control equipment) of more than 50 HP; rectifiers of more than 40 kW; rotary convertors and rotary transformers of more than 40 kW; static condensers for power factor correction of more than 40 kVA; transformers (other than rotary) of more than 40 kVA; electromedical apparatus; industrial vacuum cleaning machinery and plant; and steam generating machinery and plant (not including machinery and plant used exclusively for heating buildings).

COMMERCE and INDUSTRY

Ground Tap Supplies. *Trainees' Conditions Revised.*

The Importance of Paper

As raw material for munitions of war and for the multitudinous other uses to which it can be applied paper is an extremely important commodity. It is therefore essential that it should be used only when it must be and then as little for the purpose as possible. It is often feasible to use paper again and again before its useful life is ended, or rather before it becomes an article for salvage. When that time arrives arrangements should be made for its collection—to burn it is a crime in these days.

Power Station Staffs' Salaries

As the average cost of living figure (after deducting the increase due to taxation) during the past six months is practically the same as for the preceding half-year there will be no alteration in the scale of salaries laid down in the schedule of the National Joint Board of Employers and Members of Staff (Electricity Supply Industry) for the period from January 1st to June 30th, 1942. The figures will therefore remain as set out in our issue of July 18th, 1941.

Safeguarding Duty Exemptions

An Order made by the Treasury (the Safeguarding of Industries (Exemption) No. 6 Order, 1941), extends for a further six months (to June 30th, 1942) the exemption from the Safeguarding of Industries Duties of a number of classes of goods, including certain electrical equipment.

Building Supplies

In a memorandum upon building materials and equipment the Ministry of Works and Buildings refers to the authorisation of supplies of commodities made of iron and steel which come under the Iron and Steel Control of the Ministry of Supply. Among the equipment specifically mentioned are electric heaters of a fixed type (i.e., incorporated in the structure of buildings); pumps for domestic and agricultural water supplies; ventilating and air-conditioning equipment (fixed type) other than that required for processing purposes; and cable racks and hangers. Authorisations may be issued by the Ministry of Works to manufacturers of these goods for the essential requirements of the home trade (excluding requirements for work subject to a building or maintenance licence under Regulation 56A). Goods made under these bulk authorisations are available for distribution to merchants for sale for essential purposes, without further authorisation.

COAL IS WANTED FOR MAKING MUNITIONS TO BEAT HITLER
Have breakfast in the kitchen and use only one fire.
Be careful with your cookers.
Don't wash under running taps.
Go easy with the bath water.
IF YOU WASTE ELECTRICITY— YOU WASTE COAL
GO EASY WITH THAT SWITCH
Issued by
S.W.S. ELECTRICITY
In support of the National Fuel Economy Campaign

A new advertisement in the series which Edmundsons are utilising in the Fuel Economy Campaign

Standardisation of Taps

At the instance of the Machine Tool Control of the Ministry of Supply a scheme has been instituted by the Ground Thread Tap Association for the reduction in the number of types of tap produced. For this purpose a Ground Thread Tap Allocation Centre has been established at 101, Beechwood Avenue, Earlsdon, Coventry, to which, as from January 8th, all would-be purchasers of taps covered by the scheme must send particulars of their requirements. The Centre will then allocate the requisitions to suppliers to whom the purchasers, upon notification, must send their orders.

For the time being the scheme will cover only the following types and sizes of standard ground thread hand taps: B.A. Hand.—2, 4 and 6. B.S.W. Hand.—Size $\frac{1}{4}$ in. (pitch 24), $\frac{1}{4}$ in.(20), $\frac{5}{16}$ in. (18) and $\frac{3}{8}$ in. (16). B.S.F. Hand.—Size $\frac{1}{4}$ in. (pitch 32), $\frac{5}{16}$ in. (28), $\frac{1}{4}$ in. (26), $\frac{9}{32}$ in. (26), $\frac{5}{16}$ in. (22), $\frac{3}{8}$ in. (20), $\frac{7}{16}$ in. (18), $\frac{1}{2}$ in. (16) and $\frac{5}{8}$ in. (16).

As a result of this change, all machines capable of producing ground thread taps will be enabled to work full time without having to stop for changes in manufacturing programme, which should enormously increase output. Tap users will be protected because most taps in common use will be made to B.S.S. 949/1941.

Full particulars of the scheme may be obtained from the Manager of the above Centre or from the Controller of Jigs, Tools and Gauges, Machine Tool Control, 35, Old Queen Street, London, S.W.1.

Accrington Salary Decision

The question of the salary to be paid to the new electrical engineer to succeed Mr. A. W. Clegg, who is retiring, was discussed by the Accrington Town Council on January 5th. Councillor W. Howson moved back a recommendation that applications should be invited for the position at a salary of £850, rising by three annual increments of £25 to £925. He suggested that the salary should be £750, rising by two annual increments to £850. The amendment was defeated. Councillor R. I. Constantine thought future values would change and many

salaries would be scaled down. Those which were low would be put up. If all they heard about the Electricity Committee were true, that its standard of efficiency was such that it would practically run itself, then £750 was ample. Alderman A. E. Higham, chairman of the Electricity Committee, said the Council should realise that it was offering £500 a year less than the average salary paid by 21 similar undertakings. Councillor G. E. Slack pointed out that if they obtained a qualified man and paid him the salary suggested it would not make any material difference to the price of electricity. By a low salary they attracted only a third-rate man, and then the price of electricity would go up. The recommendation of the Committee was approved.

Burnley Appointment

At a meeting of Burnley Town Council on January 7th Councillor F. Taylor referred to a decision of the Electricity Committee inviting applications by advertisement for the post of borough electrical engineer at a commencing salary of £800, rising to £900, plus war bonus. In view of the discussion on the same question at Accrington, he asked if the salary would be adequate to secure a competent man. The Mayor suggested that the question should be deferred until the position had been actually advertised.

Alternative Conductors

In connection with Bulletin C.22 of the Ministry of Home Security, the Cable Substitution Panel has issued a memorandum on types of cable in short supply and recommendations for use of alternatives with a view to avoiding delays in delivery.

As there is a shortage of bunching and stranding capacity the following permissible alternatives should be allowed wherever possible. 1/044 conductor should be used in place of 3/029 and 1/064 in place of 3/036. Conductors of a few thick wires (*e.g.*, " fitting wire " of 1/036 or 3/020 conductor) should be used in place of multi-wire flexibles. There is also a shortage of extrusion capacity for tough-rubber-sheathed cables and taped and braided or lead-covered cables should be used instead wherever possible.

A shortage of " laying-up " capacity required to produce circular multi-core makes it desirable that wherever possible flat cable should be used for twin or three-core cables. It is emphasised that a reduction in the number of types and sizes of cables would benefit the production situation generally.

B.S.S. in America

Readers in the United States may like to know that all specifications issued by the British Standards Institution that are related to air-raid precautionary measures (BS ARP) are available at the American Standards Association, 29, West 39th Street, New York City. Likewise all civil defence memoranda, or circulars, intended for public issue are available at the British Library of Information, 50, Rockefeller Plaza, New York City.

Tin Statistics

According to the current issue of the Tin Research Institute's Statistical Bulletin, revised figures for world production of tin give a total of 209,500 long tons for the first ten months of 1941, against 187,600 tons in the corresponding period of 1940. The tin consumption of the United Kingdom totalled 24,879 tons, against 24,904 tons. World stocks of tin, including smelters' stocks and carry-over, increased by 4,736 tons during October, to 51,465 tons at the end of the month. Stocks at the end of October, 1940, were 53,890 tons.

Government Training Schemes

Revised arrangements have been made in relation to the length of courses and payments during training in connection with the Government schemes for producing skilled or semi-skilled workers for munition works.

In present circumstances it is essential that a considerable proportion of trainees should be placed in industry within eight weeks of commencement of training. It has therefore been decided to offer initially a course of from four to eight weeks at Government Training Centres and in appropriate cases to give the trainee an opportunity of taking a longer course (normally sixteen weeks) with the prospect of more responsible and interesting work in industry after training.

The starting payments for all trainees has been increased and increments will be paid normally at the end of the eighth and twelfth weeks of training to those who qualify for the longer course, subject to passing proficiency tests. In the case of draughtsmen the increments will normally be paid eight and twelve weeks after entering into the drawing office. The minimum rate for men of 21 and over will be 65s. 6d. per week and for women of 21 and over 43s. Increments for men will be 5s. and for women 3s. Proportionate rates are payable to younger trainees and in the case of those of 18 or below allowances are made which distinguish between those living at home and those in lodgings.

Exports to Malaya

Export licences are now required in the case of all goods consigned to the Straits Settlements and the Malay States. Outstanding export licences for these and the following destinations have been revoked:—British North Borneo, Gilbert and Ellice Islands Colony, Hong-kong, Nauru and Sarawak.

Argentine Engineering Congress

The Third Argentine Engineering Congress is to be held in the city of Cordoba in April next. The work of the Congress is to be spread over ten different sections one of which—the Industrial—will be dealt with in seven different groups. One of the latter will be devoted exclusively to electric power questions, with special attention to a national scheme of electricity supply.

Small Soldering Machine

A small machine for hard and soft soldering or brazing, which is made in England by S. Lanzetter, 36, New Brown Street, Manchester, 4, was designed originally for the convenience of jewellers, dental mechanics and watchmakers, but should be of use in other trades and may also be utilised for demagnetising watches.

The outfit minimises the risk of electric shock, since the mains voltage (AC only) is

stepped right down by a compact-ly housed transformer, controlled by a foot-pedal switch. Choice of heat is afforded by four tapping sockets into which is plugged a flexible lead terminating in a clip for attachment to the " work," which is then pressed against the other terminal. The latter grips a carbon rod electrode, variously shaped according to requirements, in which most of the heat is generated and transmitted by conduction. Its residual heat permits the foot switch to be economically released as soon as the solder begins to flow. The " work " must not, of course, be withdrawn from the carbon electrode before the switch is released, in order to avoid drawing-out an arc when contact is broken.

The flux used should not contain borax, which tends to crystallise upon the carbon electrode and so spoil the electrical contact. The smaller the point of contact, the more concentrated will the heating effect be. This " National " machine is rated at 40 W at from 200 to 250 V.

Paper Price Increases

Higher prices for various classes of paper are fixed by the Control of Paper (No. 41) Order, 1941. Among the classes affected are insulating cable papers.

Rating Appeal Dismissed

On January 3rd the East Sussex Rating Appeals Committee presided over by Mr. Justice Cassels dismissed, with costs, an appeal by the Ringmer and District Electricity Co., Ltd., against an increase in its rating assessment by the South Area Assessment Committee.

Calendars

The Concordia Electric Wire Co., Ltd., has sent us its 1942 calendar, which has monthly sheets printed in cheerful tones of navy blue, orange and white.

An amusing picture of their " Goblin " jumping through a " V " printed in red, white and blue, decorates the calendar with monthly sheets sent to us by the British Vacuum Cleaner and Engineering Co., Ltd.

A useful calendar with monthly sheets showing the current, preceding and following months has been sent to us by Robey & Co., Ltd., of Lincoln.

The calendar sent to us by the Bromley-Langton Electric Wire & Insulator Co., Ltd., has monthly sheets showing the date, phases of the moon and lighting-up times for the current month, and the dates of the previous and following months.

Instrument Makers' Agreement

A scheme for collaboration has been arranged between Henry Hughes and Son, Ltd., of London, and Kelvin, Bottomley & Baird, Ltd., of Glasgow, under the title of Marine Instruments, Ltd. The arrangement will not affect the individual trading of the two firms. Its purpose is to expedite and improve production and service by the exchange of ideas, the concentration of manufacture on the best instruments produced by the two firms and the avoidance of overlapping.

Fatalities

While fixing up an electric fire in a backyard chicken house at his home at Rishton, near Blackburn, James Stears, aged twenty-nine, received a fatal electric shock. At the inquest the coroner said that S ears had evidently connected the flex without switching the electricity off. A verdict of " Accidental death " was returned.

When he was repairing telephone wires at Rhuddlan recently, Walter Griffiths, a linesman, received a fatal electric shock. Some wires dropped across high-voltage electric lines and came into contact with railings which Griffiths touched. A foreman who attempted to rescue him had to be treated for shock.

Gift for Charities

To commemorate their jubilee, Ward & Goldstone, Ltd., have given £1,000 to charities, including £100 to the Electrical Industries Benevolent Association.

Cheerful Rationing

Owing to the increased cost of production " Cheerful Rationing " cards published by the Electrical Association for Women, 20, Regent Street, London, S.W.1, are now 1½d. each, 2½d. post free. The January number of this useful little leaflet has some hints on the use of powdered milk in cooking as well as several appetising recipes using carrots and other vegetables.

New Catalogues and Lists

Newman Industries, Ltd., Yate, Bristol.—Price list (SL 56) of reconditioned steam and water valves of many well-known makes.

Colloidal Research Laboratories, Ltd., 66, Petty France, London, S.W.1.—Leaflet outlining the B.A.B. system of making large surfaces luminous with fluorescent lacquer and ultra-violet rays from ordinary lamps screened with " black " glass.

TRADE MARK APPLICATION

THE following application has been made for a British trade mark. Objections may be entered within a month of January 7th.

UNITROL. No. 616,298, Class 7. Distribution and switchboards, distribution switch and junction boxes, circuit-breakers, coils, condensers, conductor wires, contacts, terminals, control apparatus, cut-outs, relays, switches, fuses, plugs, sockets and couplings, all being electrical goods, Unit Controls, Ltd., 6, Bishopsgate, London, E.C.2.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following—

MASSON " PERTURBOGRAPH " oscillograph.

Argentine Imports

Figures for the First Half of 1941

THE electrical import trade of Argentina, after a marked decrease between 1939 and 1940, showed a further decline, amounting to over 30 per cent., between the first half of 1940 and 1941. There are indications that in some cases the falling off is due to progress of local manufacture, *e.g.*, accumulators and lamps, as the value of parts for the former remains fairly high, while imports of bulbs for lamp factories actually rose.

The accompanying table, based on the recently-issued official returns, shows the value of the imports in the first six months of 1941

Electrical Imports into Argentina, January-June, 1941

	Jan.-June 1941 Pesos (000)	Inc. or dec. Pesos (000)
Cable and wire, up to 5 mm., covered with cotton, rubber, &c.	334	— 216
Cable and wire, over 5 mm., covered with cotton, rubber, &c.	217	+ 104
Cable and wire, up to 5 mm., lead-covered	37	— 79
Cable and wire, over 5 mm., lead-covered	545	— 575
Cable and wire, silk covered	44	+ 38
Cable and wire, enamelled	168	— 9
Flex, covered with cotton, wool, &c.	120	— 51
Flex, covered with silk	4	— 17
Telephone cables, underground, lead-covered and steel or iron-armoured	2,168	+ 419
Telephone cables, iron or steel, covered with cotton, gutta-percha, &c.	398	+ 237
Accessories for underground cables	36	+ 10
Insulators	38	— 79
Accumulator and battery parts	566	— 205
Complete accumulators for motor cars	5	— 42
Batteries	29	— 53
Ammeters and voltmeters	23	— 13
Bulbs for lamps and radio valves	355	+ 81
Radio-telephone apparatus	38	— 85
Receivers	1,152	— 245
Amplifiers	77	— 27
Loud-speakers	39	— 239
Radio parts	926	— 847
Radio-telegraph apparatus and parts	—	— 5
Telephones without coils	21	— 7
Telephones with coils	86	— 293
Magneto telephones	33	— 67
Telephone parts	153	— 191
Materials for telegraphs	13	— 51
Cookers, toasters, heaters, &c.	8	— 28
Switches, circuit-breakers, cut-outs, &c.	191	— 290
Vacuum cleaners	53	— 26
Electric bells	9	— 56
Insulating tape	21	— 49
Change-over switches	244	— 351
Electric furnaces	31	— 41
Incandescent lamps	244	— 749
Electric torches	66	— 177
House-service meters	803	— 877
Distribution boards	163	+ 121
Insulating tubes	9	— 3
Other electrical goods	1,107	— 236
Dynamos and motors over ½ HP	663	— 437
Fan motors	23	— 47
Motors under ½ HP	51	— 108

with a note of increase or decrease compared with 1940. It will be seen that the decline spread through every important group except telephone cables. The values stated are those adopted by the Argentine Customs Department (about 17 paper pesos may be reckoned to the £).

In a recent issue of the *Review of the River Plate* reference is made to a new era in domestic electrical service in and around Buenos Aires and other large Argentine centres. It seems that there is something of a boom in week-end cottages, served by electricity, and in the sale of plots of land for their erection. In this connection the principal electric light and power companies are making attractive window displays of modern electrical appliances.

Our contemporary goes on to say:—"It is no exaggeration to state that in the present national fuel emergency the extension of the network and mechanisms of electric current distribution will help to restore the somewhat precarious equilibrium between the rate of production of basic combustibles and the rate at which the consumption curve of combustibles in general is tending to rise. It is certain that the electric light and power field is one in which Argentina has shown truly amazing and headlong progress in recent years, a fact which has very fortunately coincided with a correlative forward march in inter-urban road construction, with a resultant deconcentration of semi-suburban residential property distribution. The lighting of highways has also advanced in miraculous fashion."

Small Export Trade

A certain amount of export trade in the simpler kinds of electrical goods from Argentina has developed. The following were the values in thousands of pesos of goods exported during the first half of 1941:—Accumulators and batteries and parts, 43; telephone apparatus and accessories, 34; radio apparatus and accessories, 1,835; incandescent lamps, 111; electric motors, 18; other electrical manufactures, 350.

ELECTRICITY SUPPLY

Minimum Charge Protest.

Aberdeen.—OBJECTION TO MINIMUM CHARGE. At a recent meeting of the Electricity Committee a letter was submitted from a consumer objecting, in the present circumstances, to the continuance of the minimum charge of 10s. per meter per half year. He contended that owing to wartime economies in the use of electricity, the minimum charge operated to the disadvantage of the small consumers. The committee, however, recommended that no action be taken in the matter, and having regard to the recent statement made on behalf of the Board of Trade to the effect that as electricity undertakings had to install plant to cover their peak load and to maintain it for use when required, it was not unreasonable that such charges should continue to be made.

Barrow-in-Furness.—TRANSFORMER.—The Electricity Committee has obtained sanction to provide a 4,000-kVA transformer for the rural supply.

Belfast.—ELECTRICITY COMMITTEE'S POSITION.—At the monthly meeting of the Corporation Alderman Henderson, M.P., asked the chairman of the Electricity Committee if it was a fact that the Government of Northern Ireland looked upon the Committee as superfluous, that it had no power. Councillor Wilton wanted to know if there had been any undue interference by the Controller or Consultant, and was the chairman satisfied that all was going well at the power station. Councillor S. B. Thompson replied that the position was very delicate and he would rather allow things to drift for a month or so to await development. The Committee was not in control; control was in the hands of the Government, and if the Corporation allowed things to develop, as he suggested, say for another month, he would be satisfied. The acting town clerk stated that he had received a formal acknowledgment from the Ministry of Commerce of the Corporation's opinion that a Controller was not necessary—that was all.

In reply to a resolution passed at a special meeting of the Electricity Committee last month the Minister of Commerce (Sir Basil Brooke) has informed the Committee that both the Controller and Consultant will serve without remuneration. The Minister states that Mr. Boyd will rely for guidance in technical matters on the advice of Mr. Kennedy, the consultant, and not on that of the technical experts of the Corporation's undertaking. A resolution that in order to prevent any further disagreement the Prime Minister should be asked to interview representatives of the Committee in relation to the whole question of Controller and Consultant was defeated by five votes to three, one member not voting. The same motion will be submitted at the next meeting of the Corporation, it is understood. The question of a successor to Mr. F. H. Whysall, city electrical manager and engineer, who is retiring in March, was left over until the next meeting of the Committee.

Further Belfast Discussions

Birkenhead.—SUPPLY TO HOSTELS.—The Electricity Committee is to provide a supply to two hostels at an estimated total cost of £2,900.

HIRED APPARATUS.—In view of the present increased cost of electrical apparatus the Electricity Committee is to consider the revision of hire charges. On the recommendation of the electrical engineer it has been decided that, owing to the present difficulty of obtaining supplies of aluminium or cast-iron pans, the issue of such accessories with cookers supplied on simple hire terms shall be discontinued.

LOAN.—Sanction has been obtained to borrow £2,000 for mains and services and £500 for consumers' motors.

Blackburn.—DISSOLUTION OF ADVISORY BOARD URGED.—The Corporation has followed up its decision not to be represented on the Mid-Lancashire Electricity Advisory Board, or to contribute to it, by a request to the Electricity Commissioners to reconsider the advisability of disbanding the Board.

Blackpool.—LOWER CHARGES IN RURAL AREA.—Charges for electricity in four Fylde townships, Hardthorn-with-Newton, Singleton, Weeton-with-Preese, and Westby-with-Plumpton, are to be reduced as from the March quarter under an agreement in 1931 when the Order covering these areas was made. Since then the charges have been 20 per cent. higher than in Blackpool; for the next ten years this addition will be reduced to 10 per cent., after which the charges will be the same as in the county borough.

Devizes.—EXTENSION.—The Wessex Electricity Co. proposes to install a high-voltage overhead line and underground cable.

Glasgow.—BATTERY LIGHTING FOR SHELTERS.—Having considered a report by the director of education on the lighting of school shelters, a sub-committee of the Council recently agreed that surface shelters erected within school boundaries should continue to be lighted by battery units. The committee decided that shelters built outside schools should be lighted by 24-V lamps with car-type accumulators and that a suitable charging equipment should be provided for connection to the public supply mains. The estimated cost of the work was £16 per shelter and the total cost £2,384. It was agreed to submit these proposals for

Electricity Co-ordination

IN the House of Commons last week Major Lyons asked the President of the Board of Trade whether he was satisfied that steps had been taken to ensure that the closest co-ordination existed between all electrical generating and distributive agencies, whether Governmental, municipal or private, so that the industry was in a position to meet any emergency demand the war effort might put on it at the shortest notice.

Captain Waterhouse replied that he was satisfied. The Electricity Commissioners and the Central Electricity Board were in close and constant consultation with the Government Departments and other authorities and undertakings concerned in regard to the national electricity requirements.

approval to the Emergency Committee for Civil Defence.

STREET LIGHTING CONTROL STATION.—A sub-committee of the Lighting Committee has considered reports from officials with regard to the application to the Scottish Home Department for consent to the borrowing of a sum to meet capital expenditure incurred in connection with the preliminary works carried out at the proposed lighting control station at Govan, prior to the building operations being suspended. The amount outstanding was stated to be £2,783. The sub-committee recommended that the proposal to proceed with a scheme for a modified control station should not be approved.

SUPPLY TO GASWORKS.—The gas manager having reported that a cable was necessary to form an alternative route for standby electrical power to the gas exhausters, the Gas Committee has authorised him to have the necessary work carried out by the Electricity Department at an estimated cost of £800.

Huddersfield.—LOAN.—Sanction to borrow £15,000 for mains and services, substations and equipment has been granted by the Electricity Commission.

HIGH-VOLTAGE CABLES.—Terms for the transference of certain 6.6 kV cables from the Central Electricity Board to the Corporation have been accepted.

EMPLOYMENT OF WOMEN.—Eight women have recently been appointed for duties at the generating station, and two for delivering electricity accounts, who will eventually become temporary meter readers.

Inverness.—YEAR'S WORKING.—According to the *Inverness Courier* the Corporation's electricity undertaking (engineer, Mr. G. C. MacLean) reached its highest point in January last year, when a peak load of 2,892 kW was recorded. Last year's total of energy generated and purchased amounted to 8,215,570 kWh, an increase of over 20 per cent., as compared with 1940. The increase is largely attributable to the larger domestic demand; over a hundred new consumers were connected up and the new equipment included 101 fires.

Manchester.—SUPPLY EXTENSION.—The Education Committee is to make arrangements with the North Wales Power Co. for a public supply of electricity to be provided at Cloverley Hall, Shropshire.

Stretford.—SHELTER HEATING.—The Corporation has obtained the approval of the Board of Education to the heating and lighting by electricity of 82 school shelters which are available to the general public.

Overseas

Denmark.—WIND POWER PLANT.—The official German news agency reports that, following the example of the Jutland port Frederikshavn, wind is to be used for the production of electricity by the Gjedser Electricity Works, which is to erect a 25-metre tower with a wind motor, costing 110,000 kr. It is hoped to obtain some 200,000 or 300,000 kWh a year at an average cost of 7.5 öre per kWh (against the normal 16 öre).

India.—WATER-POWER IN HYDERABAD.—A scheme has been prepared for utilising the water storage at Nizamsagar dam—the largest in Hyderabad—for generating electricity, states *Indian Engineering*. The cost is estimated at Rs. 50 lakhs.

Spain.—PLANT EXTENSIONS.—In view of the constantly increasing need for electricity in Spain, states the official German news agency, the electricity companies are being compelled to increase their output. The Sociedad General Gallega de Electricidad has decided to extend its plant and is raising its capital from 40,000,000 to 125,000,000 pesetas.—*Reuter's Trade Service*.

Sweden.—NEW POWER STATION.—*Reuter's Trade Service* reports that the Waterfalls Board is planning the construction of a new hydro-electric power station on the Leringsforsen rapids in North Sweden at an estimated cost of Kr. 2,750,000. Work on the station is to be started as soon as possible. The Board is also preparing plans for the possible construction of another station of 20,000 to 25,000 kW.

United States.—NEW 600,000-KW PROJECT.—Several new water-power projects have been submitted to Congress for approval. The principal scheme is the erection of a dam and power house with 600,000 kW of plant at Umatilla upstream from the Bonneville development on the Columbia River. The estimated cost is over $49 million.

TRANSPORT

Huddersfield.—TROLLEY-BUS SCHEME ABANDONED.—The Passenger Transport Committee has agreed not to pursue its scheme for placing trolley-buses on the route from Lockwood Church to the old tram terminus at Honley.

India.—RAILWAY ELECTRIFICATION.—An extension of the G.I.P. Railway electrification which has just been completed enables goods trains bound to and from Bombay docks to run directly into the Bombay Port Trust Vadala goods yard. The scheme has cost nearly Rs.1,00,000. Previously, electrically hauled goods trains from Kalyan had to be diverted into Kurla yard for a steam locomotive to be substituted before the short journey to Vadala could be made.

Manchester.—AVOIDING FLASHES.—The Highways Committee has approved a proposal of the Transport Committee to fix green reflector studs in the tram tracks at each section insulator, and, subject to the city engineer being satisfied with the experiment, it has consented to the studs being placed at half-mile intervals.

Wolverhampton.—PURCHASE OF TROLLEY-BUSES.—The Transport Committee is to purchase six double-deck trolley vehicles at an estimated cost of £18,000.

Ironmongers' Guide

THE 1942 "*Ironmonger* Diary and Hardware Buyers' Guide" follows much upon the lines of previous editions and provides a very complete volume of information for anyone associated with the hardware trades. The contents include, in addition to ample diary space, buyers' guides, a list of associations and controls, trade marks and war-time legislation. The literary contents deal with such important matters as the Limitation of Supplies Orders, war damage insurance, building supplies, goods and services price control, and specifications for building materials.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Nigerian Electric Supply Corporation, Ltd. reports an income from power sales during 1940-41 of £147,719 (against £101,205); after providing for depreciation the net profit was £97,511 (against £49,209). Taxation absorbed £42,500 (against £16,400). A dividend of 8 per cent. is paid against nil for 1939-40. The company states that it will be able to cope with the increased demand consequent upon events in Malaya without further capital expenditure.

Turner & Newall, Ltd., report that while trading profits rose to £2,545,721 in 1940-41, the net profit was reduced from £667,941 to £506,472, owing to increased provision for taxation. As already reported, the final ordinary dividend is 8¾ per cent. (against 11¼ per cent.), making 12½ per cent. for the year (against 15 per cent.). General reserve receives £100,000 and the balance carried forward is £65,189 (against £71,515 brought in).

The Electrolytic Zinc Co. of Australasia has announced a dividend of 4 per cent. for the six months ended December 31st on the preference and old ordinary shares, and 1 per cent. actual on the new ordinary shares. The corresponding dividend a year ago was 6 per cent. on both preference and ordinary shares.

Greenwood & Batley, Ltd., are maintaining their interim dividend at 5 per cent.

New Companies

Round Green Windings, Ltd.—Private company. Registered December 26th. Capital, £100. Objects: To carry on the business of manufacturers and repairers of and dealers in scientific and electrical instruments, electrical, mechanical and general engineers, etc. Subscribers: J. Simpson, The Lych, Stockingstones Road, Luton, Beds, and W. H. French, 21, Cardiff Road, Luton. Secretary: W. H. French.

Banner Electric Co., Ltd.—Private company. Registered December 26th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electrical coils, chokes, transformers, resistances, potentiometers, switches, control gear, cinematograph and television apparatus, etc. Directors: G. J. Frogley (chairman) and M. A. Frogley, both of Manor Farm, Broxbourne, Herts. Secretary: I. E. Dearsley. Registered office: 22, Armitage Road, Golders Green, N.W.11.

E.M.P. Engineering Co., Ltd.—Private company. Registered January 3rd. Capital, £1,000. Objects: To carry on the business of electrical depositors of metals and alloys, mechanical, electrical and general engineers, etc. Directors: C. Wright and D. G. Wright, both of 62, Clarendon Drive, S.W.15. Registered office: 3, Victoria Street, London, S.W.1.

Bannisters (Croydon), Ltd.—Private company. Registered January 1st. Capital, £1,000. Objects: To acquire the business carried on at 156, Cherry Orchard Road, Croydon, by Mrs. M. H. Turner, and previously conducted by Bannister, Son & Co., Ltd. (now in liquidation), and to carry on the business of radio and electrical engineers and dealers, etc. Directors: E. W. Turner and M. H. Turner, both of 1, Upfield, Croydon. Registered office: 156, Cherry Orchard Road, Croydon, Surrey.

Liss Accumulators, Ltd.—Private company. Registered December 31st. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in electric accumulators, batteries, dynamos, apparatus and accessories, electrical, radio and motor engineers, etc. Directors: E. J. Munday, Station Road, Liss, Hants, and B. G. Suthers, 12, Aldershot Road, Guildford, Surrey. Registered office: Station Road, Liss, Hants.

Associated Electronic Engineers, Ltd.—Private company. Registered January 1st. Capital, £1,000. Objects: To carry on the business of manufacturers of electrical apparatus, thermionic instruments, wireless, cinematograph and recording television, apparatus and equipment, valve amplifiers, electric and radio gramophones, etc. Directors: H. C. Westcott, 133, Culver Grove, Stanmore, Middlesex, and three others. Registered offices: 15, Copthall Avenue, London, E.C.2.

Supreme Welding and Engineering Co., Ltd.—Private company. Registered January 3rd. Capital, £1,500. Objects: To carry on the business of electric, and acetylene welders, electrical and motor engineers, etc. Directors: S. B. Caldwell, "Stanton," Wittering Lane, Heswall, Ches., and F. W. Mason, "Rosebrae," Liverpool Road South, Burscough, Lancs., W. Brown, 275, Queens Drive, Liverpool, 4. Secretary: H. Kerr.

A. E. Chapman & Co. (Old Hill), Ltd.—Private company. Registered January 1st. Capital, £6,000. Objects: To acquire the business of an electrical and wireless engineer carried on by A. E. Chapman at Reddal Hill, Old Hill, Staffs. Directors: A. E. Chapman and M. S. Chapman, both of 114, Reddal Hill Road, Old Hill, Staffs. Registered offices: 112-113, Reddal Hill Road, Old Hill, Staffs.

Companies' Returns

Statements of Capital

Bastian & Allen, Ltd.—Capital, £5,000 in £1 shares. Return dated July 4th. All shares taken up. £5,000 paid. Mortgages and charges: £5,000.

Electric Service Co. (Grimsby), Ltd.—Capital, £1,000 in 1,000 ordinary shares of £1 each. Return dated July 3rd. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Metropolitan Electric Cable & Construction Co., Ltd.—Capital, £150,000 in 120,000 ordinary shares of 10s. and 90,000 5½ per cent. cumulative redeemable preference shares of £1 each. Return dated September 10th. All shares taken up. £59,900 paid on 119,800 ordinary shares.

£90,100 considered as paid on 200 ordinary and 90,000 preference shares. Mortgages and charges: Nil.

Electrical & Auto Products (1941), Ltd.—Capital, £2,000 in 1,000 shares of £1 each and 20,000 shares of 1s. each. Return dated May 16th (filed November 26th). 954 £1 and 20,000 1s. shares taken up. £1,954 paid. Mortgages and charges: £1,000.

J. Orton (Electricians), Ltd.—Capital, £4,000 in 3,500 ordinary and 500 preference shares of £1. Return dated December 5th. 3,000 ordinary and 500 preference shares taken up. £3,500 paid. Mortgages and charges: Nil.

Boroughbridge Electrical Co., Ltd.—Capital, £500 in £1 shares. Return dated September 27th. 100 shares taken up. £100 paid. Mortgages and charges: Nil.

P. H. Jackson & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated August 28th. 301 shares taken up. £301 paid. Mortgages and charges: Nil.

Reliance Electrical Co., Ltd.—Capital, £500 in 500 shares of £1 each. Return dated September 30th (filed October 23rd). 300 shares taken up. £300 paid. Mortgages and charges: Nil.

Buckrose Light & Power Co., Ltd.—Capital, £200,000 in £1 shares. Return dated August 4th. 180,000 shares taken up. £180,000 paid. Mortgages and charges: Nil.

Bognor Regis Rediffusion Service, Ltd.—Capital, £10,000 in £1 shares. Return dated September 23rd. 7,500 shares taken up. £7,500 paid. Mortgages and charges: Nil.

H. E. Keen & Co., Ltd.—Capital, £6,000 in £1 shares. Return dated August 29th. All shares taken up. £502 paid. £5,498 considered as paid. Mortgages and charges: Nil.

Watsham's, Ltd.—Capital, £25,000 in £1 shares. Return dated August 8th. 15,510 shares taken up. £2,931 paid. £12,579 considered as paid. Mortgages and charges : Nil.

Eckington Electric Supply Co., Ltd.—Capital, £5,000 in £1 shares. Return dated August 13th. All shares taken up. £5,000 paid. Mortgages and charges: Nil.

Colvern, Ltd.—Capital, £30,000 in £1 shares. Return dated September 19th. All shares taken up. £2,500 paid. £27,500 considered as paid. Mortgages and charges: Nil.

L. Nicholson & Co., Ltd.—Capital, £6,000 in £1 shares. Return dated September 1st. 4,500 shares taken up. £952 paid. £3,598 considered as paid. Mortgages and charges: Nil.

Castle Fuse & Engineering Co., Ltd.—Capital, £15,000 in £1 shares. Return dated September 24th. All shares taken up. £12,998 paid. £2 calls unpaid. £2,000 considered as paid. Mortgages and charges: Nil.

Weald Electricity Supply Co., Ltd.—Capital, £1,000,000 in £1 shares. Return dated March 25th (filed October 2nd). All shares taken up. £671,000 paid (£1 per share on 346,000 and 10s. on 650,000 shares). £4,000 considered as paid on 4,000 shares. Mortgages and charges: Nil.

All Power Transformers, Ltd.—Capital, £100 in £1 shares. Return dated May 31st, 1940 (filed December 5th, 1941). All shares taken up. £100 paid. Mortgages and charges: Nil.

Miller Bros. (Doncaster), Ltd.—Capital, £500 in £1 shares. Return dated October 1st. All shares taken up. £500 paid. Mortgages and charges: Nil.

Automatic Electrical Refrigerators, Ltd.—Capital, £5,000 in 4,985 cumulative preference shares of £1 and 300 founders' shares of 1s. Return dated September 4th. 4,000 preference and 300 founders' shares taken up. £4,015 paid. Mortgages and charges: Nil.

Abbott & Hawkins, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1940 (filed September 6th, 1941). 2 shares taken up. £2 paid. Mortgages and charges: Nil. A further 98 shares were alloted for cash and fully called up on August 27th, 1941.

Increases of Capital

Peoples' Electric Stores, Ltd.—The nominal capital has been increased by the addition of £1,900 in £1 ordinary shares beyond the registered capital of £100.

Watliff Co., Ltd.—The nominal capital has been increased by the addition of £6,000 in £1 non-redeemable preference shares, beyond the registered capital of £15,000.

Mortgages and Charges

Sterling Distributors, Ltd.—Satisfaction (a) to the extent of £5,000 on December 13th, 1940, of mortgage registered October 3rd, 1939; and (b) to the extent of £6,500 on June 25th, 1941, of mortgage registered January 3rd, 1941. (Notices filed December 26th, 1941.) (According to the register of mortgages, the mortgages registered October 3rd, 1939 and January 3rd, 1941, originally secured £5,000 and £6,500 respectively.)

J. G. Smithson & Co., Ltd.—Mortgage on all moneys due under a contract, dated December 18th, 1941, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £250.

Truvox Engineering Co., Ltd.—Satisfaction in full on November 20th, 1941, of charge registered March 10th, 1941, securing all moneys due or to become due from the company to Westminster Bank, Ltd., on any account.

H. Howson & Co., Ltd.—Satisfaction in full on November 30th, 1941, of debenture registered August 30th, 1940, securing £300.

Electronic Research Laboratories, Ltd.—Particulars filed of £1,000 debentures authorised December 12th, 1941, charged on the company's undertaking and property, including uncalled capital, the whole amount being now issued.

Private Arrangement

Mrs. M. H. Jackson, deceased, lately trading as H. A. Jackson & Co., Caxton Works, 88-90, Chapel Street, Salford, wholesale radio and electrical dealer.—A meeting of the creditors was held recently at Manchester, when a statement of affairs was submitted showing ranking liabilities of £901 and net assets of £310, leaving a deficiency of £591. It was resolved that the estate should be administered under a deed of assignment in favour of Mr. F. E. Bendall, of Poppleton & Appleby, Manchester, as trustee.

STOCKS AND SHARES

TUESDAY EVENING.

THE war news, which is represented by communiqués from the Middle and the Far East, exercises decidedly less influence upon Stock Exchange markets than does the internal position of the money market in this country. Within the next two months or less, the Government will pay out millions of pounds sterling to holders of India Government securities, and a similar process is likely to be continued in other directions. All this money will not come into the Stock Exchange markets for reinvestment, but no doubt a goodly proportion of it can be relied upon to seek market channels for its permanent home, and in anticipation of this the prices of securities have once more turned upwards.

While the number of changes in our price-lists this week is not numerous, it must be emphasised that in many cases the quotations are nominal to the extent that the shares are difficult to buy at anything like the figures given. The demand for preference shares is as keen as ever. Notwithstanding the activities of the tax-gatherers and other claimants for cash, there is abundance of money available for use in the purchase of stocks and shares.

Money Out of Employment

As mentioned above, the Government will pay off, in March, about ninety million pounds of India Government 3 and 2½ per cent. stocks, while, a year hence, the 3½ per cent. loan will also be taken over from the stockholders at a price then to be fixed. The result will be the same as that which followed upon previous requisitionings of gilt-edged securities. The money thus released will be compelled to seek employment in one direction or another, and although a great part of it will no doubt be diverted into National War Bonds and similar war stocks, a modest proportion can be expected to flow into securities that stand below the Trustee Act requirements. Prices in the gilt-edged markets are discounting in advance the practical certainty that this will happen. Were it not for stock that comes in for sale on behalf of deceased proprietors, the consistent pressure of demand would soon sweep the market bare of supply, and leave business in the condition of being merely a matter of negotiation.

Central Electricity

Central Electricity stocks do not fall within the compass of the Trustee Act, but the security is sufficiently good for the issues to attract money, the investment of which is not confined to the strict trustee list. At the moment of writing, £9,000 Central Board 3¼ per cent. stock, dated 1974/94, May and November interest, can be bought for 99½. This pays £3 5s. 9d. per cent.; allowance for repayment at 100 in 1994 adds a few pence to the yield. Seven "dated" stocks of the Central Board are quoted in the Stock Exchange market, but in the case of only two or three is there any supply available at the present time. A few hundred pounds of the 3½ per cent., 1963/93, might be obtained at 103, June and December interest. This pays £3 7s. 6d. per cent. outright, but assuming redemption at 100 in 1963, the yield would be reduced to £3 4s. 6d. per cent.

London Passenger Transport

Nor is there much choice in the group of London Passenger Transport stocks. Of the 5 per cent. "B" stock, dated 1965/2023, there is £3,000 on offer at 117, June and December interest. This gives 4¼ per cent. flat, but allowance for possible repayment at 100 at the earlier of the two dates, 1965, would diminish the yield by 7s. per cent. About £50,000 London Electric Transport 2½ per cent. stock, February and August interest, and bearing date 1950/55, is on offer at 95¼ ex the interest due on the 1st of next month. The return here is £2 12s. 0d. per cent. on the money, raised to £2 17s. 0d. per cent. by assuming redemption at 100 in 1955.

Price Fluctuations

Cable and Wireless ordinary stock at 68½ is 3 points to the good. The rise has reduced the yield from a little over 6 per cent. on the money, to £5 16s. 10d. which is about 8s. 6d. per cent. more than the return offered by the combine's 5 per cent. preference stock at 101½. The changes in the Home electricity supply group are few and far between. Midland Counties are 9d. up at 38s. 3d. Southern Areas have improved to 18s. 9d.; Northmet 6 per cent. preference are now 30s. 6d., at which yield is less than 4 per cent. on the money. London Power 5 per cent. debenture at 104½ has gained the fraction.

Kalgoorlie Electrics, in the Overseas group, lost 1s. at 11s., and Calcutta Electric eased off to 34s. Montreal Power at 26 has risen 1½ points, dollar stocks being in demand. Brazilian Tractions, after their rise of 2⅜ last week, show a further gain of ¼ at 13⅞. Anglo-Argentine Trams continue to advance.

Amongst equipment and manufacturing shares, Mather & Platt at 42s. 6d., Lancashire Dynamos at 66s. 3d. and Lucas at the same price, are all 1/16 harder. Murex strengthened to 92s. 6d. In the lower-priced list, Ultra Electrics put on 1s. to 3s. 6d.

Overseas Shares

The tables published last week of the comparative prices of stocks and shares included in our weekly lists, can hardly be considered complete without reference to some of the Overseas electricity companies. Therefore, in order to give an idea of the manner in which

(*Concluded on page* 95)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Jan. 12	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	15	12½	53/9	..	4 12 9
British Power and Light	7	6	26/6	..	4 10 7
City of London	7½	7	26/3	..	5 6 9
Clyde Valley	8	8	37/6	..	4 5 4
County of London	10½	8	35/-	..	4 11 5
Edmundson's:					
7% Pref.	7	7	32/-	..	4 7 6
Ord.	6	6	28/-	..	4 5 9
Elec. Dis. Yorkshire	9	9	42/-	..	4 5 9
Elec. Fin. and Securities	12½	12½	43/9	..	5 14 2
Elec. Supply Corporation	11½	10	43/9	..	4 11 4
Isle of Thanet	2	Nil	9/-	..	—
Lancs Light and Power	7½	7½	33/9	..	4 9 0
Llanelly Elec.	5½	5½	22/-	..	5 0 0
Lond. Assoc. Electric	5½	4½	19/6	..	4 12 4
London Electric	7	7	24/6	..	5 14 3
London Power Deb. Red.	5	5	104½	+½	4 15 8
Metropolitan	10	8	36/3	..	4 8 5
Midland Counties	8	8	38/3	+9d.	4 3 9
Mid. Elec. Power	9	9	39/6	..	4 11 2
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec.:					
Ordinary	7	7	29/6	..	4 15 0
7% Pref.	7	7	33/-	..	4 4 10
Northampton	10	10	44/6	..	4 10 0
Notting Hill 6% Pref. (£10)	6	6	8½	..	—
Northmet Power:					
Ordinary	10	7	35/-	..	4 0 0
6% Pref.	6	6	30/6	+6d.	3 18 8
Richmond Elec.	6	6	23/9	..	5 1 1
Scottish Power	8	8	38/9	..	4 2 9
Southern Areas	5	5	18/9	+6d.	5 6 8
South London	7	7	25/-	..	5 12 0
West Devon	5	5	21/3	..	4 14 1
West Glos.	4½	4½	20/-	..	4 10 0
Yorkshire Elec.	8	8	39/6	..	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/-	+6d.	—
Calcutta Elec.	8*	7*	34/-	−1/-	—
Cawnpore Elec.	10	10	30/-	..	6 13 4
East African Power	7	7	27/-	..	5 3 8
Jerusalem Elec.	7	5	18/9	..	5 6 8
Kalgoorlie (10/-)	7½	7½	11/-	−1/-	6 16 4
Madras Elec.	6*	4*	22/6	..	3 11 1
Montreal Power	1½	1½	26	+1½	5 15 5
Palestine Elec. "A"	Nil	Nil	20/9	..	—
Perak Hydro-elec.	6	7	7/6	..	18 13 4
Shawinigan Power	83cts.	90cts.	15½	..	—
Tokyo Elec. 6%	6	6	12½	..	—
Victoria Falls Power	15	15	80/-	..	3 15 0
Whitehall Inv. Pref.	7½	7½	15/-	..	10 0 0

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Jan. 12	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	110	..	4 11 1
1955–75	5	5	114	..	4 7 9
1951–73	4½	4½	107½	..	4 3 9
1963–93	3½	3½	102	..	3 8 8
1974–94	3½	3½	99	..	3 5 8
London Elec. Trans. Ltd.	2½	2½	95xd	..	2 12 10
London & Home Counties 1955–75	4½	4½	108½	..	4 3 0
Lond. Pass. Trans.:					
A	4½	4½	117½	..	3 16 7
B	5	5	115½	..	4 6 7
C	1½	3	40	..	7 10 0
West Midlands J.E.A. 1948–68	5	5	110	+½	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	105½	..	5 13 9
Def.	1½	1½	24½	..	6 2 5
Anglo-Portuguese	8	8	13/9	..	11 12 10
Cable & Wireless:					
5½% Pref.	5½	5½	101½	..	5 8 4
Ord.	4	4	68½	+3	5 16 10
Canadian Marconi $1	Nil	4cts.	5/6	..	2 15 6
Globe Tel. & Tel.:					
Ord.	8½*	8½*	30/-xd	..	—
Pref.	6	6	28/9	..	4 3 4
Great Northern Tel.:					
(£10)	20	20	14½	..	—
Inter. Tel. & Tel.	Nil	Nil	3	..	—
Marconi-Marine	7½	7½	27/6	..	5 9 1
Oriental Tel. Ord.	11½*	16	65/-	..	4 18 6
Telephone Props.	6	6	10/-	..	12 0 0
Tele. Rentals (5/-)	10	10	8/6	..	5 17 8
Traction and Transport					
Anglo. Arg. Trans:					
First Pref. (£5)	Nil	Nil	5/-	+6d.	—
4% Inc.	Nil	Nil	9½	+2	—
Brit. Elec. Traction:					
Def. Ord.	45	45	905	..	5 0 0
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8*	8	43/9	..	3 13 1
Brazil Traction	$1	50c.	13⅞	+¼	—
Calcutta Trams	8	5½	21/3	..	5 3 6
Cape Elec. Trams	5	5	18/6xd	+6d.	5 8 3
Lancs Transport	10	10	45/-	..	4 9 0
Mexican Light:					
1st Bonds	5	5	75	..	6 13 4
Rio 5% Bonds	5	5	92½	..	5 8 3
Southern Rly.:					
5% Prefd.	5	5	63½	..	7 17 6
5% Pref.	5	5	106½	..	4 14 0
T. Tilling	10	10	46/3	..	4 6 6
Tilling & B.A.	8*	7*	52/6	..	2 13 4
West Riding	10	10	39/6	..	5 1 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Jan. 12	Rise or Fall	Yield p.c.
Equipment and Manufacturing					
					£ s. d.
Aron Elec. Ord. ..	Nil	7½	23/–	..	6 10 4
Assoc. Elec. :					
Ord.	10	10	43/9	..	4 16 3
Pref.	8	8	38/9	..	4 2 4
Automatic Tel. & El.	12½	12½	48/9	..	5 2 6
Babcock & Wilcox	11	11	45/–	..	4 17 9
British Aluminium	12½	10	45/9	..	4 7 4
British Insul. Ord.	20	20	90/–	..	4 9 0
British Thermostat (5/–)	18½	18½	13/9	..	6 14 6
British Vac. Cleaner (5/–)	12½	10	12/6	..	4 0 0
Brush Ord. ..	Nil	Nil	4/6	..	—
Callender's ..	15	15	73/9	..	4 1 4
Chloride Elec. Storage	15	15	71/3	..	4 4 3
Consolidated Signal	17	17	80/–	..	4 5 0
Crabtree (10/–) ..	17½	17½	28/3	..	6 4 0
Crompton Parkinson Ord. (5/–) ..	30	20	21/3	..	4 14 1
E. K. Cole (5/–) ..	Nil	7	9/–xd. + 3d.		5 17 9
E.M.I. (10/–) ..	Nil	6	15/–	..	4 0 0
Electric Construction	10½	10	34/6	..	5 16 0
Enfield Cable Ord.	16½	12½	53/9	..	4 13 0
Elecl. Switchgear (10/–)	16	10	20/–	..	5 0 0
English Electric ..	10	10	37/6	..	5 6 8
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–) ..	25*	22*	40/–	..	2 15 0
Ever Ready (5/–) ..	40	40	29/6	..	6 15 7
Falk Stadelmann ..	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	26/3	..	5 6 10
G.E.C. :					
Pref.	6½	6½	32/6	..	4 0 0
Ord.	20	17½	78/9	..	4 8 10
Greenwood & Batley	15	13	26/3	..	9 18 2
Hall Telephone (10/–)	15	10	15/7½	..	6 8 0
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	21/3	..	4 4 8
Hopkinsons ..	15	15	45/–	..	6 13 4
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion	32½	30	107/6	..	5 11 6
J. Lucas	15	15	66/3	+ ⅛	4 10 8
Johnson & Phillips	15	15	55/9	..	5 8 1
Lancashire Dynamo	20	20	66/3	+ ⅛	6 0 10
Laurence, Scott (5/–)	15	15	11/–	..	6 16 4
London Elec. Wire	7½	7½	25/–	..	6 0 0
Mather & Platt ..	13½	10	42/6	+ ⅛	4 14 1
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	92/6	+ ⅛	4 6 9
Pye Deferred (5/–) ..	25	25	15/–	+ ⅛	8 6 8
Revo (10/–) ..	5	20	25/7½	..	7 16 0
Reyrolle	12½	12½	56/3	..	4 9 0
Siemens Ord. ..	7½	7½	25/–	..	6 0 0
Strand Elec. (5/–) ..	2	4	3/6	..	5 14 4
S. Smith (1/–) ..	50	37½	7/–	+6d.	5 7 2
Switchgear & Cowans (5/–) ..	10	15	10/–	..	7 10 0
Tel. Condenser (10/–)	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	41/3	..	4 17 0
Telephone Mfg. (5/–)	9	9	8/3	..	5 9 1
Tube Investments ..	23½	20	87/–	..	4 12 0
Vactric (5/–) ..	4	Nil	3/6*	..	—
Vickers (10/–) ..	10	10	16/9	..	5 19 5
Ward & Goldstone (5/–)	20	20	16/6	..	6 1 8
Westinghouse Brake	17½	10	51/3	..	3 18 2
Walsall Conduits (4/–)	55	55	32/6	..	6 15 4
West, Allen (5/–) ..	7½	7½	5/–	..	7 10 0

* Dividends are paid free of Income Tax.

Stocks and Shares (*Concluded from page* 93)

prices have moved, this brief selection is appended. The comparison between the prices at the end of 1940 and of 1941 shows somewhat surprising changes:—

Share	Dec. 1939	Dec. 1940	Dec. 1941	Change on Year
	s. d.	s. d.	s. d.	s. d.
Calcutta Elec. ..	31 0	33 0	35 0	+ 2 0
East African Power	23 6	20 9	27 0	+ 6 3
Madras	21 3	25 0	22 6	– 2 6
Palestine Elec. "A"	23 9	20 0	20 9	+ 0 9
Perak Hydro-Elec. ..	19 6	16 3	7 6	– 8 9
Victoria Falls Power	67 6	70 0	80 0	+ 10 0
Whitehall Invt. pref.	14 0	12 6	15 0	+ 2 6

The outstanding feature of this group is the way in which Victoria Falls and Transvaal Power ordinary shares have consistently advanced. The dividend has been maintained at 15 per cent. So constant has been the support accorded to the shares as a front-rank South African industrial, that the diminishing yield as the price improved, made no obstacle to the steady investment of money which required good security combined with post-war possibilities. The rise in East African Power shares came about as a direct result of the success of our campaign in Libya towards the end of last year.

Rubber and Japan

During the past few business days, rubber production has become a burning question, owing, of course, to the Japanese invasion of Malaya and adjacent areas. Upon some rubber estates, work has been more or less suspended for the time being. Meanwhile, we and our Allies require all the rubber that can be produced, war purposes demanding a huge quantity of the product while, commercially speaking, rubber is wanted by the electricity supply companies, equipment and manufacturing concerns and the cable group. Electricity supply companies use a vast amount of rubber in their cable work, and any material diminution in the volume of supply might have serious, if temporary, effect upon the industry. The idea that Japanese aggressions in the rubber producing areas might cause serious diminution in the output of the raw rubber has led to general dullness in the prices of Malayan rubber companies' shares.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *can be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

1938

35556. "Magnet systems for eddy-current instruments." Kienzle Apparate Akt.-Ges. December 6th, 1937. (Cognate application, 35557 38.) (541871.)

1939

14088. "Devices for electronic analysis in television." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. May 12th, 1938. (541872.)

26807. "Electro-optical relay." H. R. Levy. September 28th, 1939. (Convention date not granted.) (541959.)

31424. "Radial-flow elastic-fluid turbines." Svenska Turbinfabriks Aktiebolaget Ljungstrom. January 16th, 1939. (541901.)

32800. "Electric line protective systems." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. December 31st, 1938. (541993.)

1940

7751. "Radiators or heat-exchange apparatus." Serck Radiators, Ltd., and A. M. Martin. April 30th, 1940. (541964.)

8280. "Loop antenna." Philco Radio & Television Corporation. June 5th, 1939. (541905.)

8644. "Cathode-ray tube envelope." Philco Radio & Television Corporation. May 20th, 1939. (541910.)

8654. "Electrical musical instruments." Hammond Instrument Co. May 18th, 1939. (Cognate applications, 8655/40 and 8656/40.) (541911.)

8893. "Electric wave transmission devices." Telephone Manufacturing Co., Ltd., and L. H. Paddle. May 18th, 1940. (542000.)

8954. "Photographic and kinematographic cameras having coupled photo-electric exposure meters." Zeiss Ikon Akt.-Ges. October 5th, 1938. (541966.)

9544. "Apparatus for generating, amplifying, modulating, or detecting electric oscillations of ultra-high-frequency." W. E. Benham. May 31st, 1940. (541933.)

9642. "Ignition magnetos provided with a rotary cylindrical magnet." J. Bernard. July 3rd, 1939. (541967.)

9644. "Multiple-field magnet ignition magnetos." J. Bernard. July 4th, 1939. (542002.)

10150. "Electrolytically produced metal coatings exhibiting patterns or designs." Kansas City Testing Laboratory. June 19th, 1939. (541934.)

10186. "Directional wireless devices." L. Lipcsey and J. Bittera. June 11th, 1940. (541881.)

10280. "Wave transmission systems." Electric & Musical Industries, Ltd., and J. Collard. June 13th, 1940. (Addition to 495815.) (541882.)

10298. "Arrangements for switching automatically from a normal source of electrical energy supply to a standby source on interruption of the former." Standard Telephones & Cables, Ltd., and J. D. Holland. June 13th, 1940. (541884.)

10349. "Electro-acoustic transducers, particularly of the moving-coil type." H. H. Jones. June 14th, 1940. (541915.)

10358. "Photo-electric cells." Baird Television, Ltd., A. G. D. West and G. A. R. Tones. June 14th, 1940. (541937.)

10361. "Rapid photographic processing apparatus." Baird Television, Ltd., and T. W. Collier. June 14th, 1940. (541889.)

10391. "Air heating and circulating systems for buildings." R. L. Davison. June 14th, 1940. (541970.)

10393. "Manufacture of selenium rectifiers." Westinghouse Brake & Signal Co., Ltd., and L. E. Thompson. June 14th, 1940. (Addition to 529791.) (541893.)

10455. "Radio transmission systems." Marconi's Wireless Telegraph Co., Ltd. June 11th, 1939. (542005.)

10456. "Means for reducing multipath signal distortion." Marconi's Wireless Telegraph Co., Ltd. June 16th, 1939. (542023.)

10463/10465. "Alternating-current electric circuit-breakers of the gas-blast type." A. Reyrolle & Co., Ltd., and R. W. Wild. June 17th, 1940. (541940/541941.)

10470. "Fluorescent materials." Kodak, Ltd. (Eastman Kodak Co.). June 17th, 1940. (542006.)

10471. "Bridge arrangement for the comparison of electrical resistances." A. D. Blumlein. June 17th, 1940. (541942.)

10547. "Cases for loading coils." Standard Telephones & Cables, Ltd., and C. W. S. Green. June 18th, 1940. (541974.)

10561. "Automatic telephone or like systems." D. L. Heptinstall. June 19th, 1940. (542010.)

10568. "Telephone systems." Automatic Telephone & Electric Co., Ltd., and R. Taylor. June 19th, 1940. (542011.)

10580. "Electric current rectifying apparatus." A. V. Tomlinson. (Cie des Friens et Signaux Westinghouse). June 19th, 1940. (542013.)

10961. "Controlled rectifiers with thermionic cathodes." M-O Valve Co., Ltd., and H. T. Ramsay. June 27th, 1940. (541919.)

11498. "Electro-magnetic couplings for transmitting mechanical power." General Electric Co., Ltd., and R. G. Jakeman. July 10th, 1940. (Cognate application, 15658/40.) (541976.)

11930. "Sealing of electrical conductors into envelopes of quartz or the like." Scophony, Ltd., and H. P. Barasch. July 19th, 1940. (Addition to 488993.) (541980.)

12059. "Resistor devices and methods of making same." Standard Telephones & Cables, Ltd. July 25th, 1939. (541922.)

12372. "Two-way transmission systems." Associated Electric Laboratories, Inc. August 14th, 1939. (541981.)

12633. "Thermal responsive switches of the glow discharge type." British Thomson-Houston Co., Ltd. August 12th, 1939. (541925.)

13049. "Gas-blast electric circuit-breakers."

J. A. Henley, and Metropolitan-Vickers Electrical Co., Ltd. August 15th, 1940. (541949.)

13181. "Electric pocket-lamps." S. D. Sullam. August 19th, 1940. (541950.)

13269. "Caps or terminals of electric-discharge tubes." British Thomson-Houston Co., Ltd., and H. K. Bourne. August 21st, 1940. (541952.)

13348. "Electro-magnets." British Thomson-Houston Co., Ltd. August 25th, 1939. (541983.)

13398. "Thermionic amplifier for coupling transmission circuits." Standard Telephones & Cables, Ltd. November 10th, 1939. (541986.)

14976. "Circuit arrangement for obtaining a control voltage for controlling the gain of a thermionic amplifier." O. K. Kolb. (Electrical Fono-Films Co., Aktieselskab.) October 7th, 1940. (541927.)

1941

11625. "Electrostatic screens for radio transformers and like apparatus." Marconi's Wireless Telegraph Co., Ltd., C. S. Cockerell, J. D. Brailsford and M. H. Cufflin. February 23rd, 1940. (Divided out of 3462/40.) (541956.)

Amended Specifications

533314. "Ignition devices for internal-combustion engines." British Thomson-Houston Co., Ltd., and another.

538136. "Lighting fittings." Simplex Electric Co., Ltd., and others.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Aberdeen. — January 21st. Town Council. Various articles, including electrical fittings, for three months. Specifications, etc., from city engineer's office; tenders to T. F. Henderson, city and water engineer, City Engineer's Office, Town House.

Belfast.—February 11th. Electricity Department. Supply of electrical materials. (See this issue.)

Kilmarnock.—January 22nd. Town Council. Various works, including electrical, at air-raid warden's post. Schedules from burgh surveyor; tenders to town clerk.

Plymouth.—January 17th. Electricity Supply Department. Corrugated copper expansion pieces for circulating water system. (January 2nd.)

South Africa.—POST OFFICE DEPARTMENT.—March 26th. Automatic exchange equipment for Cambridge, East London. P.O. Tender 16.

West Midlands.—February 3rd. Joint Electricity Authority. Grab crane and excavator at Wolverhampton generating station. (See this issue.)

Orders Placed

Barrow-in-Furness.—Electricity Committee. Accepted. Boiler re-tubing (£1,272 for materials and about £650 for works).—Stirling Boiler Co., Ltd.

Glasgow.—Electricity Committee. Accepted. Four 800-kVA transformers (£2,219).—Bruce Peebles & Co., Ltd.

Sub-Committee on Properties. Accepted. Electric food trolley for luncheon department at Municipal Buildings (£49).—Frank V. Magrini.

Health Committee. Accepted. Portable electro-cardiograph for Lennox Castle Emergency Hospital (£226).—Cambridge Instrument Co., Ltd. Electric cooker (£114), Shieldhall Fever Hospital.—Carron Company. Two Machlett model D "Dynamax" rotating anode tubes and accessories for Ruchill Hospital (£699).—D. B. Selkirk & Co.

Huddersfield.—Electricity Department. Accepted. Rails and junction castings.—Metropolitan-Vickers Electrical Co., Ltd. Fire equipment.—Pyrene Co., Ltd.

London.—SOUTHWARK.—Electricity Committee. Accepted. Feeder pillar (£73).—W. Lucy & Co., Ltd.

Manchester.—Gas Committee. Accepted. Wiring houses at Broadway, Partington.—Fillingham & Thompson.

Electricity Committee. Accepted. Switchgear equipment.—Ferguson, Pailin, Ltd. Reconstruction of air supply arrangements to boilers.—John Thompson Water-Tube Boilers, Ltd.

Education Committee. Accepted. Main control switch, College of Technology electricity substation.—Crompton Parkinson, Ltd.

Middlesbrough.—Corporation. Accepted. Repairs to the electrical installation and generating sets at the Crathorne Hall Auxiliary Hospital (£140).—Tangyes, Ltd.

Salford.—Light Committee. Recommended Induction motor for power station (£525).—Lancashire Dynamo & Crypto.

Southport.—Gas Committee. Accepted. Overhaul of 75-kW generator engine at gasworks (£250).—J. Browett Lindley, Ltd.

Transport Committee. Accepted. Wiring and fitting bus heaters (£125).—Brooks & Southworth.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashton-in-Makerfield.—British Restaurants for U.D.C.; A. K. Dennis, surveyor, Council Offices, Bryn Street.

Barking.—Additions; C. and M. Welding Co., Ltd.

Barrow-in-Furness.—Restaurant, Devon Street; borough engineer.

Birkenhead.—Nursery, Cavendish Road; borough engineer.

Blackhall (Co. Durham).—Miners' canteen; Jos. Huntley & Son, contractors, Marion Street, Sunderland.

Blackpool. — Nursery, Lostock Gardens; borough engineer.
Store, Talbot Road; C & S Brewery, Ltd.

Bolton.—Canteen; North End Spinning Co., Ltd.
Feeding centre, Great Lever; borough engineer.
Canteen; Wm. Heaton & Sons, Ltd.

Bournemouth.—Cooking depot, Bradpole Road; G. Shears & Sons, Ltd.

Brighouse.—Canteen; Ormerod Bros., Ltd., silk spinners, Prince of Wales' Mills.
Conversion of premises into British Restaurants at Rastrick and Hipperholme (£4,850); H. A. Sneezum, borough engineer, Town Hall.

Cheltenham.—Three day nurseries; G. G. Marsland, borough engineer, Municipal Offices.

Chesterfield.—Messroom and fire-watchers' accommodation for Town Council; A. F. White, builder, 198, Derby Road, Chesterfield.

Coventry.—Police accommodation (£2,725); city engineer.

Cramlington (Northumberland). — Hostel; Cackett, Burns Dick & McKellar, Ellison Place, Newcastle-on-Tyne.

Darlington.—Conversion of the Corn Exchange into restaurant; borough engineer.

Gateshead.—Offices and stores, Park Road, for Transport Department (£1,100); F. H. Patterson, borough engineer, Municipal Buildings.

Glasgow.—Office extensions, Bulldale Street, Yoker; Bull's Metal & Melloid Co., Ltd.
Canteen additions; Henry Wiggin & Co., Ltd.
Canteen, St. Rollox railway siding; Fleming Bros.
Canteen, 11, Lochburn Road; Smith Fullerton, Ltd.

Hinckley.—Garage; Midland Packing Co., Westfields Road.

Hull.—First-aid post, East Park (£4,832); city engineer.

Jarrow.—Extensions to school accommodation at Monkton (£600); J. S. Weir, borough engineer.

Leatherhead.—School canteen and British Restaurant, Fetcham, for U.D.C.; J. L. Davies, surveyor, Council Offices.

Leek.—Adaptation of school for use as British Restaurant (£3,000); H. Henshaw, clerk, Town Hall.

Leyton.—British Restaurant in Lea Bridge area; borough surveyor, Town Hall, Leytonstone, E.10.

Lichfield.—Sewage pumping station for R.D.C.; J. G. Rimand, surveyor, Rural Council House.

Littlehampton.—Mess room and store; D. Hillyard.

Liverpool.—Refrigerated chamber and plant at Belmont Institution; city engineer, Municipal Buildings, Liverpool, 2.

Maidenhead.—Kitchen at Ellington School; borough surveyor, The Guildhall.

Manchester.—Extension of stores at Langho Colony and Emergency Hospital; G. N. Hill, city architect, Town Hall.

Restaurants, Chorlton and Miles Platting; city engineer.
Kitchen and heating improvements at institutions (£16,000); city engineer.

Medomsley (Co. Durham).—Canteen at Derwent Colliery; J. J. Eltringham, Derwent Street, Blackhill, Co. Durham.

Newcastle-on-Tyne.—Sixty wardens' posts (£6,757) and clinic in Church Street (£700); city architect, 18, Cloth Market, Newcastle.
Five British Restaurants for the City Council; R. G. Roberts, architect, 18, Cloth Market.
Adaptation of premises at Penrith to accommodate 60 people; J. F. C. Solomon, city estate and property surveyor, Town Hall, Newcastle-on-Tyne.

Newcastle-under-Lyme.—British Restaurant at Wolstanton; A. Cotton, borough surveyor, Municipal Buildings.

Oswestry.—Electrical installations at Institution laundry for Shropshire P.A.C.; J. G. Chant, county architect, 5, Belmont, Shrewsbury.

Potters Bar.—Fire station, for U.D.C.; T. T. Thorpe, clerk, Darkes Lane.

Rotherham.—Baths, canteen, etc.; Steel, Peech & Tozer, Ltd.
Canteens in 19 shelters; V. Turner, borough engineer, Town Hall.
Workshop; Guest & Chrimes, Ltd.

Scarborough.—Alterations and equipment at bakery for cooking meals (£500); H. V. Overfield, borough surveyor, Town Hall, Scarborough.

Seaton Valley (Northumberland).—Communal feeding centres for Urban District Council at Crambington, Shiremoor and Seghill; S. E. Burgess, surveyor, U.D.C. offices, Seaton Delaval, Northumberland.

Sheffield.—Temporary schools, Handsworth and Parson Cross (£23,706); city engineer.

Southport.—Nurseries, Grantham Road and North Road; borough engineer.

Stalybridge.—School canteen, Market Street; borough engineer.

Stretford.—Council offices, Clyne House, Chester Road; borough engineer.

Torquay.—School kitchen; borough engineer.

Wakefield. — Workshop, Technical college (£1,760); city engineer.
Additions for Slater & Crabtree; J. Percy Firth, architect.
Additions; J. Redgwick & Sons, Ltd.

Warrington.—School shelters (£29,146).—J. Y. Hughes, borough surveyor, Municipal Building, Bank Park.
Fire station, etc., Howley tannery; J. & W. N. Hutchings, Ltd.

Wembley.—Nursery, grounds of County School, Princes Avenue, Kingsbury; borough engineer.

Wolverhampton.—School huts (£3,446); E. G. Lester, Ltd., Stafford.
Office extensions, Lower Horsley Field; A. M. Griffith & Son, Ltd.
Workshop and engine testing installation, Park Lane; Jackson & Edmonds.
Office extensions; Birmingham Road and Raby Street; Marcus Brown & Lewis.
Canteen, Cable Street; Bayliss Jones & Bayliss.